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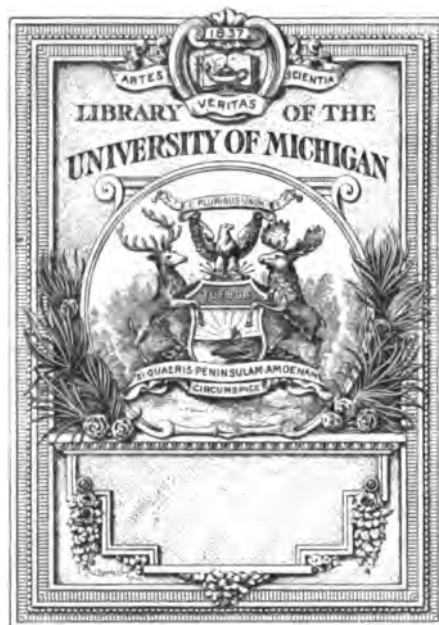
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DEPARTMENT OF COMMERCE AND LABOR

U. S. BUREAU OF THE CENSUS

*= Census of Electrical Industries. Electric Light and Power Industry, 1907*  
E. DANA DURAND, DIRECTOR

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SPECIAL REPORTS

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CENTRAL ELECTRIC LIGHT AND  
POWER STATIONS

1907



WASHINGTON  
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1910



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By THOMAS COMMERFORD MARTIN, Expert Special Agent.

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## LETTER OF TRANSMITTAL.

DEPARTMENT OF COMMERCE AND LABOR,  
BUREAU OF THE CENSUS,  
*Washington, D. C., June 20, 1910.*

SIR:

The act of Congress of June 7, 1906, amendatory of section 7 of the act approved March 6, 1902, provides that statistics concerning central electric light and power stations shall be collected by the Bureau of the Census at quinquennial periods.

I have the honor to submit herewith the first report prepared in conformity with the requirements of this law. The report presents statistics concerning the physical equipment, service, and financial operations of the central electric light and power stations. This is the second census of the central electric stations that has been taken since the Bureau of the Census was made a permanent office. The first census covered the year ending December 31, 1902, and was taken in accordance with the provisions of section 7 of the act of Congress of March 6, 1902.

In order to preserve the comparability of the data, the same form of schedule was used to collect statistics at both censuses, and, as nearly as possible, the same form of presenting the data has been followed in both reports. The statistics were collected and the report prepared under the supervision of Mr. William M. Steuart, chief statistician for manufactures. Mr. T. Commerford Martin, of New York City, was the consulting expert special agent of the office and prepared the portion of the report dealing with the technical features of the industry. Acknowledgment should also be made of the services of Mr. Frank L. Sanford, who prepared the analytical tables and verified the text.

Very respectfully,



*Director of the Census.*

HON. CHARLES NAGEL,  
*Secretary of Commerce and Labor.*

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# CENTRAL ELECTRIC LIGHT AND POWER STATIONS

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# CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

## CHAPTER I.

### SCOPE AND GROUPING OF THE STATISTICS.

*Central stations.*—The act of Congress approved June 7, 1906, amending section 7 of the act establishing a permanent Census Office, authorizes the Director of the Census to collect every five years statistics relating to street railways, electric light and power, and the telephone and telegraph business. This report relates to central electric stations which furnish electrical energy for lighting and heating and power for manufacturing and mining purposes, for street railways and elevators, for charging batteries, etc. Central stations are classed as "commercial" and "municipal," the former being those operated by individuals, companies, and corporations; and the latter those operated by municipalities. The census takes no cognizance of electric stations that are operated by the Federal Government or of those operated primarily for the service of state institutions.

Central stations are further classed as "purely electric" and "composite." The central stations devoted solely to the generation and sale of electrical energy are designated as "purely electric." The majority of the central stations are of this class. Central stations engaged in the electric business and also in other industries, such as the manufacture of gas and the operation of waterworks, electric railways, ice plants, mining and other commercial enterprises, are designated as "composite." There is scarcely a limit to the variety of industries that are conducted under the same management with electric plants, such association of industries being the result of a belief that economy of administration is secured thereby. In many instances only one system of accounts is kept for all of the industries conducted under the same ownership, and this makes it difficult to obtain statistics which relate exclusively to the central electric light and power stations. When it was impossible to secure from book accounts exact data for the electric plants as distinct from other business, careful estimates as to the generation and sale of electric current were obtained.

No estimate could be made, however, in the case of the income and expenses that should be credited to the various phases of the business when steam was furnished for heating, or electric fixtures and supplies were sold in connection with the operation of the elec-

tric plant, and consequently the income and expenses pertaining to these transactions are included in those shown as incident to the operation of the station. Furthermore, it was often impracticable to apportion the capital among the various industries when other business was conducted in connection with the operation of the electric plant, and therefore the reported capital does not represent the amount actually chargeable to the electrical industry. The difficulty attending the segregation of capital is more fully explained in the chapter on capitalization, where an effort is made to show the capital properly chargeable to the central stations.

*Municipal stations.*—As already indicated, electric light and power plants operated under the ownership of municipalities and other local governments are considered as "central stations," and statistics for them are included in this report. These plants, generally established primarily to furnish current for lighting the public buildings, streets, and parks, frequently sell large quantities of electricity for commercial uses. Their field of operation is similar to that of the commercial stations, and their sources of revenue are much the same.

Although as a rule no cash income is derived from the furnishing of current for the use of the municipality, in order that the income shown in this report may represent the total consumption of electrical energy, the income for such energy furnished for municipal purposes has been estimated on the basis of what would have been paid for similar service if this service had been supplied by a commercial company in the vicinity.

The methods of conducting municipal plants, however, differ in so many important respects from those of the commercial plants that the statistics for the two classes of plants are presented separately.

*Electric-railway plants and central electric stations.*—The tendency to sell electricity for general commercial use is constantly increasing among electric-railway companies. It was impossible, however, in some instances, to obtain statistics concerning the capital, employees, expenses, etc., relating to the sale of electricity by railway companies for purposes similar to those reported by the central stations. As a rule but

one system of accounts is employed when the generating apparatus is used for the railway service and also for commercial light or power service, and is located in the same building and operated by the same primary power; in such cases it is impracticable to obtain separate financial statistics for the two branches of service. In all cases where separate data could be obtained, the statistics were included in the reports for the central stations and for the railways, respectively. If, however, separate returns could not be prepared, the statistics for the entire plant and equipment were included in the report on Street and Electric Railways, but certain features, such as the income from the sale of electrical energy, the number of lamps wired for service, the number of stationary motors, and the number of meters on consumption circuits, were so reported in the schedule as to enable their separate presentation, which will be found in Tables 146 to 148.

In 1902 there were 251 railway companies which furnished electricity for light, power, and other purposes. These companies reported an aggregate income of \$7,703,574 from the sale of current. In 1907 there were 330 railway companies in this class, and the income from the sale of current amounted to \$20,093,302. In 1902 the annual output of all electric stations and electric railways amounted to 4,768,535,512 kilowatt hours. In 1907 the output of the two classes of stations was 10,621,406,837 kilowatt hours, the increase in that year as compared with 1902 being 5,852,871,325 kilowatt hours, or 122.7 per cent. In 1902 the output by electric railways formed 47.4 per cent of the total, but by 1907 the proportion for such railways had decreased to 44.9 per cent. Because of consolidations of the two branches of the industry and the growing tendency of the railway companies to sell electricity for commercial purposes, the reports for the railway companies show an encroachment upon the field of the central stations, and the separate statistics for these latter stations are becoming less representative of the electrical energy sold for general commercial purposes. Nevertheless, the figures indicate that during the five years ending with 1907 the central stations increased more rapidly than the electric railways.

*Isolated plants.*—For the purpose of lighting and furnishing power for factories, hotels, or other enterprises, a large quantity of electricity is generated in plants which are operated for the exclusive benefit of their owners. Some of these plants sell limited amounts of current, but they were established as adjuncts to other forms of business, and practically no statistics concerning them are included in the census reports. Some of these isolated plants are extensive and have a much larger capacity than many of the central stations. At the census of 1902 it was estimated that there were 50,000 of these isolated electric plants in the United States. The number of commercial and municipal

plants increased from 3,620 in 1902 to 4,714 in 1907, the increase amounting to 1,094, or 30.2 per cent. The application of the same rate of increase to the estimated number of isolated plants in 1902 gives an estimate of 65,000 for 1907. To what extent the utilization of surplus power in the operation of private electric plants to furnish light and power for large mills, department stores, hotels, and other industrial enterprises, has stimulated the increase in these plants it is impossible to state, and the above estimate, therefore, may be more or less than the actual number of isolated plants in existence.

*Power or generating plants.*—Census reports are prepared as far as possible in conformity with the systems of bookkeeping in use in the different establishments. Frequently two or more power or generating plants operated under the same management had but one system of accounts, and consequently it was necessary to include the statistics for all classed as a "central station" on the same census schedule. In the vast majority of cases only one power plant is operated under the same ownership, and the term "central station" of the census classification, therefore, generally represents one plant, but it is evident that the terms "central station" and "power or generating plant" are not synonymous. Although the statistics for a central station may represent a number of these plants, every effort was made to obtain separate census reports for the plants located in separate states, even if they were conducted under the same ownership.

The number of primary-power or generating plants was not called for in the schedule used for reporting central stations in 1907, but some idea of their number may be had from the fact that the returns showed 4,731 plants equipped with dynamos for the generation of electricity. Of the 4,714 stations reported in 1907, 227 had no generating equipment, while 113 had more than one power plant. This latter class reported 357 generating stations.

*Period covered.*—This census relates to the calendar year ending December 31, 1907. The only other complete enumeration of the central electric stations covered the twelve months ending June 30, 1902. At both censuses reports of the establishments were accepted for the business year which most nearly conformed to the census year, and all stations that were in operation during any portion of the respective census years were included. Therefore, although most of the reports were prepared for the census year, they do not necessarily represent the same period of twelve months, or even an entire year. In 1902 reports covering a period of less than a year were furnished by 141 commercial and 38 municipal stations, and in 1907, by 202 commercial and 49 municipal stations. The majority of the reports covering less than a year were for stations that commenced operations during the census year. Some reports of this kind, however, were for



properties that changed ownership during the year, the new owners being unable to furnish statistics for the operations conducted under the previous ownership. These variations in the period covered by the reports necessarily have some influence on certain statistics, such as the output of stations. As a rule, however, the reports covering less than a year are for comparatively small plants, and the statistics for such plants have but little effect upon the various totals. The census takes no cognizance of stations that had not begun operations prior to the close of the census year, except that limited statistics are presented in Chapter VI, pages 74 and 75, for such stations as were under construction during the year.

*Basis of canvass.*—In the endeavor to secure statistics from all central stations lists of the names and addresses of such concerns were prepared from information obtained from the postmasters in the different cities and towns and from directories and other sources of information. These lists formed the basis of the canvass. The United States was divided into districts and each district given to one or more agents, who were instructed not only to secure reports from all stations named on the lists, but to make careful inquiry for other stations. It is believed that in this way a thorough canvass was made of the entire country and reports were secured from all plants that should be classed as "central stations."

*Grouping of statistics.*—Tables 118 to 145 contain all of the detailed statistics that were collected for 1907 for the central stations in each state and territory. In other tables and text statements the statistics have been grouped under appropriate headings, and comparisons made, when possible, with the data for 1902. The most important classifications of the statistics are the following:

1. Commercial central stations, or those that were operated under private ownership, whether by individuals, companies, or corporations.

2. Municipal central stations, or those that were operated by state, city, or other local governments, except those operated specially for institutions.

3. Purely electric central stations, or those that do a strictly electrical business.

4. Composite central stations, or those operated in connection with some other industry.

5. Central stations according to dynamo capacity.

6. Central stations operated by water power exclusively.

7. Central stations operated by steam power exclusively.

8. Central stations operated by both steam and water power.

9. Central stations in selected cities where all or practically all of the current is produced and consumed within the incorporated limits of the cities.

This grouping of the statistics closely follows the arrangement established at the census of 1902, in order that comparisons may be made to show the development of the industry.

The report of 1902 shows the number of central stations that commenced operations each year from 1881 to 1902, but this feature was abandoned at the census of 1907 because changes in ownership are so frequent that in many instances it is impossible to obtain the date on which operations were commenced.

The ease and practicability of long-transmission lines has caused a great extension of the area which may be covered by lines from a central station, and therefore it often happens that the generating station is located at a place which from the standpoint of population is comparatively insignificant, whereas the places at which the electrical energy is delivered for use may be of considerable size. On the other hand, many stations located in large cities are extending their service into the surrounding territory. For these reasons, a classification of central (generating) stations by the population of the places in which these stations are located would not convey a correct idea of the population served, or available for service, and consequently this presentation also, which was shown in 1902, has been abandoned.

The meager statistics concerning electric stations collected at the census of 1890 are not presented in this report because they are so fragmentary that they are not fairly comparable with those for subsequent censuses.

## CHAPTER II.

### SUMMARY OF STATISTICS.

The magnitude of the central electric station industry in the census years 1902 and 1907, and the growth during the five-year period, are shown in Table 1.

TABLE 1.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS: 1907 AND 1902.

|                                                                | TOTAL.          |                  | COMMERCIAL.     |                  | MUNICIPAL.   |                  | PER CENT OF INCREASE. |             |            |
|----------------------------------------------------------------|-----------------|------------------|-----------------|------------------|--------------|------------------|-----------------------|-------------|------------|
|                                                                | 1907            | 1902             | 1907            | 1902             | 1907         | 1902             | Total.                | Commercial. | Municipal. |
| Number of stations.....                                        | 4,714           | 3,620            | 3,462           | 2,805            | 1,252        | 815              | 30.2                  | 23.4        | 53.6       |
| Cost of construction and equipment.....                        | \$1,096,913,622 | \$504,740,352    | \$1,054,034,175 | \$482,719,879    | \$42,879,447 | \$22,020,473     | 117.3                 | 118.4       | 94.7       |
| Gross income.....                                              | \$175,642,338   | \$85,700,605     | \$161,630,339   | \$78,735,500     | \$14,011,999 | \$6,965,105      | 104.9                 | 105.3       | 101.2      |
| Electric service.....                                          | \$109,614,091   | \$84,186,605     | \$156,000,257   | \$77,349,749     | \$13,614,434 | \$6,836,856      | 101.5                 | 101.7       | 99.1       |
| Lighting.....                                                  | \$125,755,114   | \$70,138,147     | \$112,714,851   | \$63,389,284     | \$13,040,263 | \$6,748,863      | 79.3                  | 77.8        | 93.2       |
| Stationary motors.....                                         | \$28,511,550    | \$9,910,217      | \$27,995,177    | \$9,839,677      | \$516,373    | \$70,540         | 187.7                 | 184.5       | 632.0      |
| All other.....                                                 | \$15,348,027    | \$4,138,241      | \$15,290,229    | \$4,120,788      | \$57,798     | \$17,453         | 270.9                 | 271.1       | 231.2      |
| All other sources.....                                         | \$6,027,647     | \$1,514,000      | \$5,630,082     | \$1,385,751      | \$397,565    | \$128,249        | 298.1                 | 306.3       | 210.0      |
| Total expenses.....                                            | \$106,205,149   | \$55,457,830     | \$97,037,961    | \$50,716,648     | \$9,167,188  | \$4,741,182      | 91.5                  | 91.3        | 93.4       |
| Cost of supplies and materials, including power purchased..... | \$21,400,823    | \$11,280,423     | \$19,665,919    | \$10,303,956     | \$1,734,904  | \$976,467        | 89.7                  | 90.9        | 77.6       |
| Cost of fuel.....                                              | \$23,057,745    | \$11,635,509     | \$19,824,962    | \$10,189,685     | \$3,232,783  | \$1,445,824      | 98.2                  | 94.6        | 123.6      |
| Miscellaneous expenses.....                                    | \$26,326,257    | \$11,895,206     | \$25,611,771    | \$11,456,037     | \$714,486    | \$439,169        | 121.3                 | 123.6       | 62.7       |
| Salaries and wages.....                                        | \$35,420,324    | \$20,646,692     | \$31,935,309    | \$18,766,970     | \$3,485,015  | \$1,879,722      | 71.6                  | 70.2        | 85.4       |
| Salaried officials, clerks, etc.—                              |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 12,990          | 6,996            | 11,375          | 6,046            | 1,615        | 950              | 85.7                  | 88.1        | 70.0       |
| Salaries.....                                                  | \$11,733,787    | \$5,663,580      | \$10,738,955    | \$5,206,199      | \$994,832    | \$457,381        | 107.2                 | 106.3       | 117.5      |
| Wage-earners—                                                  |                 |                  |                 |                  |              |                  |                       |             |            |
| Average number.....                                            | 34,642          | 23,330           | 30,691          | 20,803           | 3,951        | 2,467            | 48.5                  | 47.1        | 60.2       |
| Wages.....                                                     | \$23,686,537    | \$14,983,112     | \$21,196,354    | \$13,560,771     | \$2,490,183  | \$1,422,341      | 58.1                  | 56.3        | 75.1       |
| Primary power: <sup>1</sup>                                    |                 |                  |                 |                  |              |                  |                       |             |            |
| Number of machines.....                                        | 10,150          | 7,485            | 8,205           | 6,325            | 1,945        | 1,160            | 35.6                  | 29.7        | 67.7       |
| Horsepower capacity.....                                       | 4,032,365       | 1,830,594        | 3,712,518       | 1,671,401        | 319,847      | 159,193          | 120.3                 | 122.1       | 100.9      |
| Steam engines and steam turbines—                              |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 7,206           | 5,930            | 5,492           | 4,870            | 1,714        | 1,060            | 21.5                  | 12.8        | 61.7       |
| Horsepower.....                                                | 2,627,450       | 1,379,941        | 2,344,032       | 1,232,923        | 283,418      | 147,018          | 90.4                  | 90.1        | 92.8       |
| Gas engines—                                                   |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 463             | 165              | 385             | 147              | 78           | 18               | 180.6                 | 161.9       | 333.3      |
| Horsepower.....                                                | 55,828          | 12,181           | 49,746          | 11,224           | 6,082        | 957              | 358.3                 | 343.2       | 535.5      |
| Water wheels—                                                  |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 2,481           | 1,390            | 2,328           | 1,308            | 153          | 82               | 78.5                  | 78.0        | 86.6       |
| Horsepower.....                                                | 1,349,087       | 438,472          | 1,318,740       | 427,254          | 30,347       | 11,218           | 207.7                 | 208.7       | 170.5      |
| Generating equipment:                                          |                 |                  |                 |                  |              |                  |                       |             |            |
| Dynamos—                                                       |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 12,173          | 12,484           | 9,778           | 10,602           | 2,395        | 1,822            | 2.5                   | 8.3         | 31.4       |
| Kilowatt capacity.....                                         | 2,709,225       | 1,212,235        | 2,500,209       | 1,068,855        | 209,016      | 113,380          | 123.5                 | 127.5       | 84.3       |
| Direct-current, constant-voltage—                              |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 3,680           | 3,823            | 3,169           | 3,405            | 511          | 418              | 3.7                   | 6.9         | 22.2       |
| Kilowatt capacity.....                                         | 406,460         | 330,065          | 379,706         | 312,509          | 26,754       | 17,556           | 23.1                  | 21.5        | 52.4       |
| Direct-current, constant-amperage—                             |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 1,685           | 3,539            | 1,246           | 2,957            | 439          | 582              | 52.4                  | 57.9        | 24.6       |
| Kilowatt capacity.....                                         | 80,992          | 145,866          | 61,753          | 117,695          | 19,239       | 28,171           | 44.5                  | 47.5        | 31.7       |
| Alternating single-phase and poly-phase current—               |                 |                  |                 |                  |              |                  |                       |             |            |
| Number.....                                                    | 6,908           | 5,122            | 5,363           | 4,300            | 1,445        | 822              | 32.9                  | 24.7        | 75.8       |
| Kilowatt capacity.....                                         | 2,221,773       | 736,304          | 2,058,750       | 668,651          | 163,023      | 67,653           | 201.7                 | 207.9       | 141.0      |
| Output of stations, kilowatt hours.....                        | 5,862,276,737   | 2,507,051,115    | 5,572,813,949   | 2,311,146,670    | 289,462,788  | 195,904,439      | 133.8                 | 141.1       | 47.8       |
| Lamps wired for service: <sup>2</sup>                          |                 |                  |                 |                  |              |                  |                       |             |            |
| Arc.....                                                       | 555,713         | 385,668          | 472,773         | 334,903          | 82,940       | 50,795           | 44.1                  | 41.2        | 63.3       |
| Incandescent.....                                              | 41,445,997      | 18,194,044       | 37,393,549      | 16,616,593       | 4,052,448    | 1,577,451        | 127.8                 | 125.0       | 156.9      |
| Other varieties—Nernst, vacuum, vapor, etc.....                | 162,338         | ( <sup>3</sup> ) | 153,468         | ( <sup>4</sup> ) | 8,870        | ( <sup>5</sup> ) |                       |             |            |

<sup>1</sup> Includes the estimated income for current consumed in municipal buildings and in lighting streets, parks, etc.

<sup>2</sup> Exclusive of auxiliary engines with a total capacity of 65,823 horsepower in 1907 and 14,454 horsepower in 1902.

<sup>3</sup> Decrease.

<sup>4</sup> Exclusive of 275,079 lamps used by the central stations to light their own electric properties in 1907. These lamps were not reported separately in 1902.

<sup>5</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

<sup>6</sup> Not reported separately.

As previously explained, the figures for the central stations do not represent the entire production of electrical energy. To arrive at the aggregate it would be necessary to consider also the electric railways, telephone and telegraph lines, electric police-patrol and fire-alarm systems, and the isolated electric plants.

In 1907, exclusive of the isolated electric plants, there were upward of 30,000 individuals, companies, corporations, and municipalities which reported the

generation or utilization of electric current in what may be termed "commercial enterprises." These industries represent an outstanding capitalization of \$6,209,746,753, of which \$1,367,338,836 is credited to central electric stations, \$3,774,772,096 to electric railways, \$814,616,004 to commercial or mutual telephone companies, and \$253,019,817 to telegraph companies, the latter item including \$32,726,242, the capital stock of wireless-telegraph companies. The capitalization of

the 17,702 independent farmer or rural telephone lines and of the 1,157 electric police-patrol and fire-alarm systems could not be ascertained. In addition, there were a number of companies organized for the purpose of acquiring the capital stock or bonds of electric companies, street railways, gas and water systems, and similar properties, holding the same for investment and to some extent supervising the operation of the underlying companies. To show the capitalization of these holding companies would be misleading as applied to central electric stations, since it would be impossible to determine the extent of its application to the electrical industry as distinguished from others. In view of this condition and because of the difficulty of securing the information, it was deemed advisable to omit the data as relating to central stations.

In view of the very large increases shown for the details of the industry as a whole, it seems necessary to state that the loss shown in the number and the capacity of the direct-current machines was due to the fact that this type of dynamo has been superseded by the alternating single-phase and polyphase current machine.

Although central-station statistics of the comparatively few street railways that sold current and that were able to prepare complete separate reports have been included with those for central electric stations, in order that that branch of the electrical industry might be shown as fully as possible, the full measure of growth of central-station work does not appear in Table 1 because of the fact that this service is also largely carried on by numerous street-railway companies which combine the central-station business so closely with other activities as not to permit of complete separate reports. Detailed statistics for the electric-railway companies which were unable to make separate reports will be found in Tables 146, 147, and 148, and a brief summary of the same is presented in Table 2.

TABLE 2.—Central electric stations operated by street-railway companies: 1907 and 1902.

[Complete separate reports for these stations could not be secured, hence the full statistics for them have been included with those for electric railways. This table does not include central stations operated by street-railway companies which furnished complete separate reports.]

|                                                 | 1907         | 1902        | Per cent of increase. |
|-------------------------------------------------|--------------|-------------|-----------------------|
| Number of stations.....                         | 177          | 118         | 50.0                  |
| Gross income.....                               | \$17,291,824 | \$6,469,726 | 167.3                 |
| Electric service.....                           | \$16,576,555 | \$6,271,815 | 164.3                 |
| Lighting.....                                   | \$13,273,296 | \$5,492,669 | 141.7                 |
| Stationary motors.....                          | \$2,685,013  | \$768,040   | 249.6                 |
| All other.....                                  | \$618,247    | \$111,106   | 5,466.8               |
| All other sources.....                          | \$715,269    | \$197,911   | 261.4                 |
| Lamps wired for service:                        |              |             |                       |
| Arc.....                                        | 80,102       | 33,863      | 136.5                 |
| Incandescent <sup>1</sup> .....                 | 4,545,839    | 1,442,685   | 215.1                 |
| Other varieties—Nernst, vacuum, vapor, etc..... | 28,641       | (?)         | .....                 |
| Stationary motors:                              |              |             |                       |
| Number.....                                     | 20,468       | 10,049      | 103.7                 |
| Horsepower.....                                 | 158,923      | 35,698      | 345.3                 |
| Meters on consumption circuits, number.....     | 213,886      | 56,601      | 277.9                 |

<sup>1</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

<sup>2</sup> Not reported separately.

Table 2 shows that while the number of stations which were unable to make separate reports is growing, there is still greater increase in their importance. The increase in the income for electric service, \$10,822,098, does not fully represent this feature of the electric service, since, as shown in the report on street railways, 330 companies reported the sale of electric current during 1907, and the income from this source amounted to \$20,093,302. Some of the current was sold to other electric railways, but a large portion was used for light and power in enterprises not connected with the railways. However, statistics of income and equipment can be shown separately for only 177 companies. The increases in number of lamps, number and horsepower of stationary motors, and number of meters on consumption circuits, not only show the rapid growth of central-station work in connection with the operation of street railways, but demonstrate the wonderful facility with which electrical energy may be utilized wherever there is a demand for light or power.

*Ownership of central electric stations.*—Table 3 shows the number of commercial central stations conducted under the different forms of ownership.

TABLE 3.—Commercial central electric stations—Number, by character of ownership: 1907 and 1902.

| CHARACTER OF OWNERSHIP.   | 1907  | 1902  | Per cent of increase. | PER CENT DISTRIBUTION. |       |
|---------------------------|-------|-------|-----------------------|------------------------|-------|
|                           |       |       |                       | 1907                   | 1902  |
| Total.....                | 3,462 | 2,805 | 23.4                  | 100.0                  | 100.0 |
| Individual.....           | 609   | 528   | 15.3                  | 17.6                   | 18.8  |
| Firm.....                 | 298   | 228   | 30.7                  | 8.6                    | 8.1   |
| Incorporated company..... | 2,555 | 2,049 | 24.7                  | 73.8                   | 73.1  |

<sup>1</sup> Includes 2 stations classed as "Other forms of ownership," in order that the operations of individual stations may not be disclosed.

Although the number of stations operated by the several forms of ownership can not properly be used to determine their relative importance, it shows the character of ownership which predominates and which seems to be one of the distinctive features of the industry. Nearly three-fourths of the stations reported at each census were operated by incorporated companies. Individual ownership was next in importance as to number of stations, with less than one-fifth of the total at each census. The percentage which stations under individual ownership represent of the total number for all classes decreased from 18.8 in 1902 to 17.6 in 1907, a loss of 1.2. Firms showed but little proportionate change, having less than 9 per cent of the total number at each census. Detailed statistics for 1907 for the different forms of ownership are presented in Table 4. These statistics are confined to 1907 because in 1902 data as to character of ownership were limited to the number of establishments.

TABLE 4.—COMMERCIAL CENTRAL ELECTRIC STATIONS, BY CHARACTER OF OWNERSHIP: 1907.

|                                                 | CHARACTER OF OWNERSHIP. |             |             |                                    |
|-------------------------------------------------|-------------------------|-------------|-------------|------------------------------------|
|                                                 | Total.                  | Individual. | Firm.       | Incorporated company. <sup>1</sup> |
| Number of stations.....                         | 3,462                   | 609         | 298         | 2,555                              |
| Cost of construction and equipment.....         | \$1,054,034,176         | \$6,574,920 | \$4,019,813 | \$1,043,439,442                    |
| Gross income.....                               | \$101,630,339           | \$2,371,467 | \$1,478,134 | \$157,780,738                      |
| Electric service.....                           | \$156,000,257           | \$2,262,102 | \$1,408,139 | \$152,330,016                      |
| Lighting.....                                   | \$112,714,851           | \$2,130,822 | \$1,273,793 | \$109,310,236                      |
| Stationary motors.....                          | \$27,995,177            | \$90,528    | \$96,801    | \$27,817,848                       |
| All other.....                                  | \$15,290,229            | \$50,752    | \$37,545    | \$15,201,932                       |
| All other sources.....                          | \$5,630,082             | \$109,365   | \$69,995    | \$5,450,722                        |
| Total expenses.....                             | \$97,037,961            | \$1,615,426 | \$1,021,788 | \$94,400,747                       |
| Cost of supplies and materials.....             | \$12,969,731            | \$231,471   | \$175,456   | \$12,562,804                       |
| Cost of fuel.....                               | \$19,824,962            | \$560,453   | \$317,946   | \$18,946,563                       |
| Power purchased.....                            | \$6,696,188             | \$58,157    | \$40,590    | \$6,597,441                        |
| Miscellaneous expenses.....                     | \$25,611,771            | \$206,510   | \$119,502   | \$25,285,699                       |
| Salaries and wages.....                         | \$31,935,309            | \$558,835   | \$368,234   | \$31,008,240                       |
| Salaries officials, clerks, etc.—               |                         |             |             |                                    |
| Number.....                                     | 11,375                  | 171         | 139         | 11,065                             |
| Salaries.....                                   | \$10,738,955            | \$112,065   | \$89,614    | \$10,536,676                       |
| Wage-earners—                                   |                         |             |             |                                    |
| Average number.....                             | 30,691                  | 863         | 495         | 29,333                             |
| Wages.....                                      | \$21,196,354            | \$446,170   | \$278,620   | \$20,471,564                       |
| Primary power:                                  |                         |             |             |                                    |
| Number of machines.....                         | 8,981                   | 847         | 436         | 7,698                              |
| Horsepower capacity.....                        | 3,776,837               | 74,668      | 47,025      | 3,655,144                          |
| Steam engines—                                  |                         |             |             |                                    |
| Number.....                                     | 5,144                   | 520         | 285         | 4,339                              |
| Horsepower.....                                 | 1,546,007               | 50,662      | 30,034      | 1,465,311                          |
| Steam turbines—                                 |                         |             |             |                                    |
| Number.....                                     | 348                     | 1           |             | 347                                |
| Horsepower.....                                 | 798,025                 | 30          |             | 797,995                            |
| Gas engines—                                    |                         |             |             |                                    |
| Number.....                                     | 385                     | 83          | 37          | 265                                |
| Horsepower.....                                 | 49,746                  | 3,577       | 1,399       | 44,770                             |
| Water wheels—                                   |                         |             |             |                                    |
| Number.....                                     | 2,328                   | 209         | 103         | 2,016                              |
| Horsepower.....                                 | 1,318,740               | 18,751      | 14,957      | 1,285,032                          |
| Auxiliary engines—                              |                         |             |             |                                    |
| Number.....                                     | 776                     | 34          | 11          | 731                                |
| Horsepower.....                                 | 64,319                  | 1,648       | 635         | 62,036                             |
| Generating equipment:                           |                         |             |             |                                    |
| Dynamos—                                        |                         |             |             |                                    |
| Number.....                                     | 9,778                   | 839         | 412         | 8,527                              |
| Kilowatt capacity.....                          | 2,500,209               | 44,315      | 28,511      | 2,427,383                          |
| Direct-current, constant-voltage—               |                         |             |             |                                    |
| Number.....                                     | 3,169                   | 403         | 193         | 2,573                              |
| Kilowatt capacity.....                          | 379,706                 | 15,365      | 6,981       | 357,360                            |
| Direct-current, constant-amperage—              |                         |             |             |                                    |
| Number.....                                     | 1,246                   | 39          | 17          | 1,190                              |
| Kilowatt capacity.....                          | 61,753                  | 1,014       | 407         | 60,332                             |
| Alternating single-phase and polyphase current— |                         |             |             |                                    |
| Number.....                                     | 5,363                   | 397         | 202         | 4,764                              |
| Kilowatt capacity.....                          | 2,058,750               | 27,936      | 21,123      | 2,009,691                          |
| Output of stations, kilowatt hours.....         | 5,572,813,949           | 43,103,493  | 41,357,746  | 5,488,352,710                      |
| Lamps wired for service: <sup>2</sup>           |                         |             |             |                                    |
| Arc.....                                        | 472,773                 | 5,758       | 3,021       | 463,994                            |
| Incandescent <sup>3</sup> .....                 | 37,393,549              | 736,594     | 406,116     | 36,250,839                         |
| Other varieties—Nernst, vacuum, vapor, etc..... | 153,468                 | 625         | 355         | 152,488                            |

<sup>1</sup> Includes 2 stations classed as "Other forms of ownership" in order that the operations of individual stations may not be disclosed.

<sup>2</sup> Exclusive of 275,079 lamps used by the central stations to light their own electric properties.

<sup>3</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

The statistics in Table 4 show the great preponderance of corporate ownership. The proportions contributed by the corporations to several of the chief totals of the table were as follows: Cost of construction and equipment, 99 per cent; income from sale of current, 97.6 per cent; primary horsepower, 96.8 per cent; kilowatt capacity of dynamos, 97.1 per cent; output of stations, 98.5 per cent; number of arc lamps, 98.1 per cent; and number of incandescent lamps, 96.9 per cent. If the municipal stations were included, the proportions for incorporated companies would be less, but they would still represent about 90 per cent of the several totals, while of the remaining 10 per cent, roughly speaking, about 2 per cent may be assigned to individuals and firms, with individual ownership having somewhat the larger share, and 8 per cent to municipalities.

As already stated, central stations may be divided into the purely electric, those which were operated solely as electrical enterprises; and the composite,

those which were operated in connection with some other industry or service, such as waterworks, gas plants, etc. Table 5 gives detailed statistics of these two classes of stations subdivided by character of ownership.

A comparison of the totals for the two groups of stations shows that about three-fifths of the income and cost of construction and equipment was connected with the purely electric and two-fifths with the composite stations. Nearly two-thirds of the commercial central stations were reported as purely electric, and something more than one-third as composite. This division of commercial stations may also be accepted as roughly representing the respective importance of the purely electric and the composite stations. While the proportions for the chief items for the commercial stations are thus decidedly greater in the purely electric than in the composite class, this does not hold true for the municipal stations, where such important totals as income, expenses, horsepower of primary-

power plant, kilowatt capacity of dynamos, and number of incandescent lamps are greater for the composite stations. The fact that such public utilities as water and gas are so often operated by municipalities which also operate electric stations explains this condition. Nearly four-fifths of the purely electric central stations

and more than three-fifths of those in the composite group were commercial stations. Exclusive of the item of arc lamps, about 6 per cent of the income and equipment of the purely electric group was reported by the municipal stations, as compared with about 10 per cent for these stations in the composite group.

TABLE 5.—PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS, BY CHARACTER OF OWNERSHIP: 1907.

|                                                  | Total.          | PURELY ELECTRIC STATIONS. |             |                                    |              | COMPOSITE STATIONS. |             |                       |              |
|--------------------------------------------------|-----------------|---------------------------|-------------|------------------------------------|--------------|---------------------|-------------|-----------------------|--------------|
|                                                  |                 | Commercial.               |             |                                    | Municipal.   | Commercial.         |             |                       | Municipal.   |
|                                                  |                 | Individual.               | Firm.       | Incorporated company. <sup>1</sup> |              | Individual.         | Firm.       | Incorporated company. |              |
| Number of stations.....                          | 4,714           | 397                       | 175         | 1,555                              | 521          | 212                 | 123         | 1,000                 | 731          |
| Cost of construction and equipment.....          | \$1,096,913,622 | \$4,427,517               | \$2,291,942 | \$632,717,815                      | \$23,489,640 | \$2,147,403         | \$1,727,871 | \$410,721,627         | \$19,389,807 |
| Gross income.....                                | \$175,642,338   | \$1,606,500               | \$863,938   | \$98,751,829                       | \$0,732,654  | \$764,967           | \$614,196   | \$59,028,909          | \$7,259,345  |
| Electric service.....                            | \$169,614,091   | \$1,538,157               | \$813,222   | \$95,705,459                       | \$0,572,736  | \$723,945           | \$594,917   | \$56,024,357          | \$7,041,698  |
| Lighting.....                                    | \$125,755,114   | \$1,442,855               | \$751,275   | \$67,189,245                       | \$0,294,077  | \$687,967           | \$522,818   | \$42,120,991          | \$6,745,586  |
| Stationary motors.....                           | \$28,511,550    | \$63,834                  | \$35,121    | \$17,852,985                       | \$261,061    | \$16,694            | \$61,080    | \$9,964,863           | \$255,312    |
| All other.....                                   | \$15,348,627    | \$31,468                  | \$26,826    | \$10,663,229                       | \$16,968     | \$19,284            | \$10,719    | \$4,538,703           | \$40,800     |
| All other sources.....                           | \$0,027,047     | \$68,343                  | \$50,716    | \$3,046,370                        | \$179,918    | \$41,022            | \$19,779    | \$2,404,352           | \$217,647    |
| Total expenses.....                              | \$106,205,149   | \$1,078,567               | \$580,033   | \$57,456,650                       | \$4,374,925  | \$536,859           | \$441,755   | \$36,944,097          | \$4,792,263  |
| Cost of supplies and materials.....              | \$14,326,351    | \$155,112                 | \$96,035    | \$7,360,405                        | \$678,961    | \$76,359            | \$79,121    | \$5,202,399           | \$677,659    |
| Cost of fuel.....                                | \$23,057,745    | \$374,037                 | \$185,345   | \$10,592,454                       | \$1,324,732  | \$186,416           | \$132,601   | \$8,354,109           | \$1,908,051  |
| Power purchased.....                             | \$7,074,172     | \$56,278                  | \$27,237    | \$4,598,100                        | \$277,004    | \$1,879             | \$13,563    | \$1,999,341           | \$100,380    |
| Miscellaneous expenses.....                      | \$26,326,357    | \$137,143                 | \$65,721    | \$16,314,907                       | \$531,000    | \$69,367            | \$53,841    | \$8,970,792           | \$382,886    |
| Salaries and wages.....                          | \$35,420,324    | \$355,997                 | \$205,095   | \$18,590,784                       | \$1,761,728  | \$202,838           | \$162,139   | \$12,417,456          | \$1,723,287  |
| Salaried officials, clerks, etc.—                |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 12,990          | 100                       | 78          | 6,469                              | 615          | 71                  | 61          | 4,596                 | 1,000        |
| Salaries.....                                    | \$11,733,787    | \$65,261                  | \$50,325    | \$6,438,363                        | \$406,875    | \$47,404            | \$39,289    | \$4,098,313           | \$587,957    |
| Wage-earners—                                    |                 |                           |             |                                    |              |                     |             |                       |              |
| Average number.....                              | 34,642          | 555                       | 272         | 17,494                             | 1,941        | 308                 | 223         | 11,839                | 2,010        |
| Wages.....                                       | \$23,686,537    | \$290,736                 | \$155,370   | \$12,152,421                       | \$1,354,853  | \$155,434           | \$123,250   | \$8,319,143           | \$1,135,330  |
| Primary power—                                   |                 |                           |             |                                    |              |                     |             |                       |              |
| Number of machines.....                          | 10,998          | 532                       | 242         | 4,446                              | 819          | 315                 | 194         | 3,252                 | 1,198        |
| Horsepower capacity.....                         | 4,098,188       | 48,370                    | 25,440      | 2,250,483                          | 149,018      | 26,298              | 21,585      | 1,404,661             | 172,333      |
| Steam engines—                                   |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 6,829           | 339                       | 160         | 2,343                              | 657          | 181                 | 125         | 1,996                 | 1,028        |
| Horsepower.....                                  | 1,810,040       | 34,082                    | 16,820      | 785,663                            | 113,729      | 16,580              | 13,214      | 679,648               | 150,304      |
| Steam turbines—                                  |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 377             | .....                     | .....       | 181                                | 11           | 1                   | .....       | 166                   | 18           |
| Horsepower.....                                  | 817,410         | .....                     | .....       | 596,712                            | 10,150       | 30                  | .....       | 201,283               | 9,235        |
| Gas engines—                                     |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 463             | 66                        | 30          | 166                                | 33           | 17                  | 7           | 99                    | 45           |
| Horsepower.....                                  | 55,828          | 2,867                     | 1,049       | 18,736                             | 2,796        | 710                 | 350         | 26,034                | 3,286        |
| Water wheels—                                    |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 2,481           | 104                       | 44          | 1,343                              | 84           | 105                 | 59          | 673                   | 69           |
| Horsepower.....                                  | 1,349,087       | 10,535                    | 7,326       | 824,211                            | 21,813       | 8,216               | 7,631       | 460,821               | 8,534        |
| Auxiliary engines—                               |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 848             | 23                        | 8           | 413                                | 34           | 11                  | 3           | 318                   | 38           |
| Horsepower.....                                  | 65,823          | 886                       | 245         | 25,161                             | 530          | 762                 | 390         | 36,875                | 974          |
| Generating equipment—                            |                 |                           |             |                                    |              |                     |             |                       |              |
| Dynamos—                                         |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 12,173          | 556                       | 251         | 4,878                              | 1,064        | 283                 | 161         | 3,649                 | 1,331        |
| Kilowatt capacity.....                           | 2,709,225       | 29,620                    | 16,477      | 1,528,189                          | 96,528       | 14,695              | 12,034      | 899,194               | 112,488      |
| Direct-current, constant-voltage—                |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 3,680           | 257                       | 121         | 1,409                              | 228          | 146                 | 72          | 1,164                 | 283          |
| Kilowatt capacity.....                           | 406,460         | 10,357                    | 4,370       | 196,380                            | 11,360       | 5,008               | 2,611       | 160,980               | 15,394       |
| Direct-current, constant-amperage—               |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 1,685           | 34                        | 12          | 732                                | 266          | 5                   | 5           | 458                   | 173          |
| Kilowatt capacity.....                           | 80,992          | 919                       | 304         | 38,040                             | 12,241       | 95                  | 103         | 22,292                | 6,998        |
| Alternating, single-phase and polyphase current— |                 |                           |             |                                    |              |                     |             |                       |              |
| Number.....                                      | 6,808           | 265                       | 118         | 2,737                              | 570          | 132                 | 84          | 2,027                 | 875          |
| Kilowatt capacity.....                           | 2,221,773       | 18,344                    | 11,803      | 1,293,769                          | 72,927       | 9,592               | 9,320       | 715,922               | 90,096       |
| Output of stations, kilowatt hours.....          | 5,862,276,737   | 27,704,477                | 15,193,414  | 3,692,080,449                      | 145,109,547  | 15,399,016          | 26,164,332  | 1,796,272,261         | 144,353,241  |
| Lamps wired for service: <sup>2</sup>            |                 |                           |             |                                    |              |                     |             |                       |              |
| Arc.....                                         | 555,713         | 4,055                     | 1,924       | 280,101                            | 48,206       | 1,703               | 1,097       | 183,833               | 34,734       |
| Incandescent.....                                | 41,445,997      | 522,444                   | 245,456     | 21,852,656                         | 1,710,564    | 214,150             | 160,660     | 14,398,183            | 2,341,884    |
| Other varieties—Nernst vacuum, vapor, etc.....   | 162,338         | 447                       | 262         | 112,060                            | 5,575        | 178                 | 93          | 40,419                | 3,295        |

<sup>1</sup> Includes 2 stations classed as "Other forms of ownership," in order that the operations of individual stations may not be disclosed.

<sup>2</sup> Exclusive of 275,079 lamps used by the central stations to light their own electric properties.

<sup>3</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

Table 6 presents a comparative summary of the purely electric and the composite plants for 1907 and 1902.

The percentages of increase for the composite stations are much greater than for the purely electric, but the absolute increases show no such excess. On the contrary, the purely electric stations show a

greater absolute increase for all the leading items. It is noteworthy that both the commercial and the municipal stations share in the uniformly larger percentages of increase for the composite stations, which appears to indicate that the distinctive characteristics of the two classes of stations are much less marked than formerly.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 6.—PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—COMMERCIAL AND MUNICIPAL: 1907 AND 1902.

|                                                          | Census. | Aggregate.      | PURELY ELECTRIC STATIONS. |               |              | COMPOSITE STATIONS. |               |              |
|----------------------------------------------------------|---------|-----------------|---------------------------|---------------|--------------|---------------------|---------------|--------------|
|                                                          |         |                 | Total.                    | Commercial.   | Municipal.   | Total.              | Commercial.   | Municipal.   |
| Number of stations.....                                  | 1907    | 4,714           | 2,648                     | 2,127         | 521          | 2,066               | 1,335         | 731          |
| Per cent of increase.....                                | 1902    | 3,620           | 2,139                     | 1,759         | 380          | 1,481               | 1,046         | 435          |
|                                                          |         | 30.2            | 23.8                      | 20.9          | 37.1         | 39.5                | 27.6          | 68.0         |
| Cost of construction and equipment.....                  | 1907    | \$1,096,913,622 | \$662,926,914             | \$639,437,274 | \$23,489,640 | \$433,986,708       | \$414,596,901 | \$19,389,807 |
| Per cent of increase.....                                | 1902    | \$504,740,352   | \$334,151,724             | \$320,580,333 | \$13,571,391 | \$170,588,028       | \$162,139,546 | \$8,449,082  |
|                                                          |         | 117.3           | 98.4                      | 99.5          | 73.1         | 154.4               | 155.7         | 129.5        |
| Gross income.....                                        | 1907    | \$175,642,338   | \$107,974,921             | \$101,222,267 | \$6,752,654  | \$67,667,417        | \$60,408,072  | \$7,259,345  |
| Per cent of increase.....                                | 1902    | \$85,700,606    | \$58,603,406              | \$54,455,737  | \$4,147,669  | \$27,097,199        | \$24,279,763  | \$2,817,436  |
|                                                          |         | 104.9           | 84.2                      | 86.9          | 62.8         | 149.7               | 107.6         | 157.7        |
| Electric service.....                                    | 1907    | \$169,614,691   | \$104,629,574             | \$98,056,838  | \$6,572,736  | \$64,685,117        | \$57,943,419  | \$7,041,698  |
| Per cent of increase.....                                | 1902    | \$84,186,606    | \$57,470,597              | \$53,394,158  | \$4,076,439  | \$26,710,008        | \$23,955,591  | \$2,760,417  |
|                                                          |         | 101.5           | 82.1                      | 83.6          | 61.2         | 141.9               | 141.9         | 155.1        |
| All other sources.....                                   | 1907    | \$6,027,647     | \$3,345,347               | \$3,165,429   | \$179,918    | \$2,682,300         | \$2,464,653   | \$217,647    |
| Per cent of increase.....                                | 1902    | \$1,514,000     | \$1,132,809               | \$1,061,579   | \$71,230     | \$381,191           | \$324,172     | \$57,019     |
|                                                          |         | 298.1           | 196.3                     | 198.2         | 152.6        | 603.7               | 600.3         | 281.7        |
| Total expenses.....                                      | 1907    | \$106,205,149   | \$63,490,175              | \$59,115,250  | \$4,374,925  | \$42,714,974        | \$37,922,711  | \$4,792,263  |
| Per cent of increase.....                                | 1902    | \$55,457,830    | \$37,272,578              | \$34,525,512  | \$2,747,066  | \$18,185,252        | \$16,191,136  | \$1,994,116  |
|                                                          |         | 91.5            | 70.3                      | 71.2          | 59.3         | 134.9               | 134.2         | 140.3        |
| Primary power: <sup>1</sup>                              |         |                 |                           |               |              |                     |               |              |
| Number of machines.....                                  | 1907    | 10,150          | 5,561                     | 4,776         | 785          | 4,589               | 3,429         | 1,160        |
| Per cent of increase.....                                | 1902    | 7,485           | 4,615                     | 4,032         | 583          | 2,870               | 2,293         | 577          |
|                                                          |         | 35.6            | 20.5                      | 18.5          | 34.7         | 59.9                | 49.5          | 101.0        |
| Horsepower capacity.....                                 | 1907    | 4,032,365       | 2,446,489                 | 2,298,001     | 148,488      | 1,585,876           | 1,414,517     | 171,359      |
| Per cent of increase.....                                | 1902    | 1,830,594       | 1,242,362                 | 1,151,520     | 90,842       | 588,232             | 519,881       | 68,351       |
|                                                          |         | 120.3           | 96.9                      | 99.6          | 63.5         | 169.6               | 172.1         | 150.7        |
| Generating equipment:                                    |         |                 |                           |               |              |                     |               |              |
| Dynamos—                                                 |         |                 |                           |               |              |                     |               |              |
| Number.....                                              | 1907    | 12,173          | 6,749                     | 5,685         | 1,064        | 5,424               | 4,093         | 1,331        |
| Per cent of increase.....                                | 1902    | 12,494          | 7,752                     | 6,783         | 969          | 4,732               | 3,879         | 853          |
|                                                          |         | *2.5            | *12.9                     | *16.2         | 9.8          | 14.6                | 5.5           | 56.0         |
| Kilowatt capacity.....                                   | 1907    | 2,709,225       | 1,670,814                 | 1,574,286     | 96,528       | 1,038,411           | 925,923       | 112,488      |
| Per cent of increase.....                                | 1902    | 1,212,235       | 818,805                   | 753,021       | 65,784       | 393,430             | 345,834       | 47,596       |
|                                                          |         | 123.5           | 104.1                     | 109.1         | 46.7         | 163.9               | 167.7         | 136.3        |
| Output of stations, kilowatt hours.....                  | 1907    | 5,862,276,737   | 3,880,087,887             | 3,734,978,340 | 145,109,547  | 1,962,188,850       | 1,837,835,609 | 144,353,241  |
| Per cent of increase.....                                | 1902    | 2,507,061,115   | 1,836,748,836             | 1,716,909,602 | 119,839,234  | 670,302,279         | 594,237,074   | 76,065,205   |
|                                                          |         | 133.8           | 111.2                     | 117.5         | 21.1         | 195.7               | 209.3         | 89.8         |
| Lamps wired for service: <sup>2</sup>                    |         |                 |                           |               |              |                     |               |              |
| Arc.....                                                 | 1907    | 555,713         | 334,286                   | 286,080       | 48,206       | 221,427             | 186,693       | 34,734       |
| Per cent of increase.....                                | 1902    | 385,698         | 252,407                   | 219,409       | 32,998       | 133,291             | 115,494       | 17,797       |
|                                                          |         | 44.1            | 32.4                      | 30.4          | 46.1         | 66.1                | 61.6          | 95.2         |
| Incandescent <sup>3</sup> .....                          | 1907    | 41,445,997      | 24,331,120                | 22,620,556    | 1,710,564    | 17,114,877          | 14,772,993    | 2,341,884    |
| Per cent of increase.....                                | 1902    | 18,194,044      | 12,248,918                | 11,463,050    | 785,868      | 5,945,126           | 5,153,543     | 791,583      |
|                                                          |         | 127.8           | 96.6                      | 97.3          | 117.7        | 187.9               | 186.7         | 195.8        |
| Other varieties—Nernst, vacuum, vapor, etc. <sup>4</sup> | 1907    | 162,338         | 118,353                   | 112,778       | 5,575        | 43,985              | 40,660        | 3,295        |

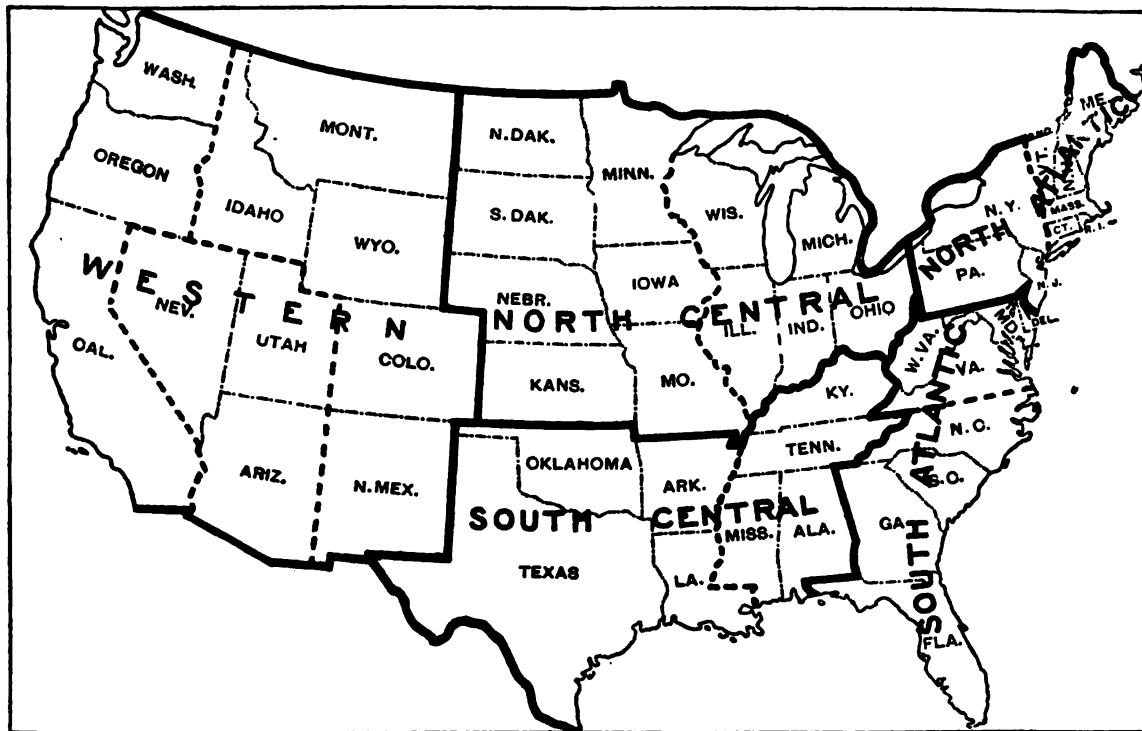
<sup>1</sup> Exclusive of auxiliary engines with a total capacity of 65,823 horsepower in 1907 and 14,454 horsepower in 1902.<sup>2</sup> Decrease.<sup>3</sup> Exclusive of 275,079 lamps used by the central stations to light their own electric properties in 1907. These lamps were not reported separately in 1902.<sup>4</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.<sup>5</sup> Not reported separately in 1902.

*Relationship of population and central stations.*—As a rule, the central electric stations are concentrated in the most populous states and at points within these states from which the largest percentage of the population can be served economically. From Table 119 it appears that New York, Pennsylvania, Illinois, and Ohio, the 4 states having the largest population, containing together 29.6 per cent of the total for the United States, reported 1,296 electric stations, or 27.5 per cent of the total number in operation during 1907, and the annual output of these stations amounted to 2,553,745,890 kilowatt hours, or 43.6 per cent of the output of all stations in the United States. While

the proportionate number of central stations and the proportionate population of this group of states were very nearly the same, or less than one-third of the total, their proportion of the kilowatt-hour output formed nearly one-half of the total. In 1902 the exact percentages for these items were as follows: Population, 29.7 per cent; number of establishments, 30.8 per cent; and kilowatt-hour output, 49.1 per cent.

A number of the tables contained in this report present the statistics by the officially adopted geographic divisions. An outline and a list follow, showing the states and territories contained in each division:

MAP 1.—GEOGRAPHIC DIVISIONS.

**North Atlantic division:**

Maine.  
New Hampshire.  
Vermont.  
Massachusetts.  
Rhode Island.  
Connecticut.  
New York.  
New Jersey.  
Pennsylvania.

**South Atlantic division:**

Delaware.  
Maryland.  
District of Columbia.  
Virginia.  
West Virginia.  
North Carolina.  
South Carolina.  
Georgia.  
Florida.

**North Central division:**

Ohio.  
Indiana.  
Illinois.  
Michigan.  
Wisconsin.  
Minnesota.  
Iowa.

**North Central division—Continued.**

Missouri.  
North Dakota.  
South Dakota.  
Nebraska.  
Kansas.

**South Central division:**

Kentucky.  
Tennessee.  
Alabama.  
Mississippi.  
Louisiana.  
Arkansas.  
Oklahoma.  
Texas.

**Western division:**

Montana.  
Idaho.  
Wyoming.  
Colorado.  
New Mexico.  
Arizona.  
Utah.  
Nevada.  
Washington.  
Oregon.  
California.

38.9 and 42.7 per cent; output of stations, 42.4 and 50.6 per cent; number of arc lamps, 43.6 and 44 per cent; and number of incandescent lamps, 41.5 and 47.1 per cent.

The South Atlantic and South Central divisions, treated as a single group, embraced 32.7 per cent of the population in 1907 and 32.4 per cent in 1902. Although their proportions of the various items of the central-station industry were larger in 1907 than in 1902, they were the smallest shown for any section of the country. The exact percentages for each of these two divisions for 1907 and 1902 were as follows: South Atlantic, population, 13.5 and 13.7 per cent, respectively; horsepower of primary-power plant, 7.2 and 5 per cent; kilowatt capacity of dynamos, 7.2 and 5.1 per cent; output of stations, 4.5 and 4.1 per cent; number of arc lamps, 4.9 and 4.5 per cent; and number of incandescent lamps, 4.6 and 3.4 per cent. The South Central, population, 19.1 and 18.6 per cent; horsepower of primary-power plant, 6 and 6.4 per cent; kilowatt capacity of dynamos, 6.1 and 6.8 per cent; output of stations, 4.4 and 6.1 per cent; number of arc lamps, 7.2 and 6 per cent; and number of incandescent lamps, 6.5 and 5.6 per cent. The Western division was the smallest in population, with 5.6 per cent of the total in 1907 and 5.5 per cent in 1902. Its percentages of the various items for the central-station industry for 1907 and 1902, respectively, were as follows: Horsepower of primary-power plant, 19.6 and 15.2 per cent; kilowatt capacity of dynamos, 18 and 14.4 per cent; output of stations, 23.8 and 13.4 per cent; number of arc lamps, 7.6 and 7.8 per cent; and number of incandescent lamps, 13 and 10 per cent.

The largest proportion of the total population of the country, 33.9 per cent in 1907 and 34.5 per cent in 1902, was in the North Central states. These states also contained nearly the same percentage of electric lamps wired for service, but for the horsepower of primary-power plants, kilowatt capacity of dynamos, and output of stations, the percentages were considerably less. The North Atlantic states were next in the proportion of population, with 27.8 per cent in 1907 and 27.7 per cent in 1902, but their proportions for the various items of the central-station industry for both 1907 and 1902 were much larger, as follows: Horsepower of primary-power plant, 37.4 and 44.2 per cent, respectively; kilowatt capacity of dynamos,



## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 7.—CENTRAL ELECTRIC STATIONS—RELATION OF LEADING ITEMS TO POPULATION, BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

| DIVISION.                      | Cen-<br>sus. | Popu-<br>lation. <sup>1</sup> | NUMBER OF STATIONS. |                       |                 | HORSEPOWER OF<br>ENGINES AND<br>WATER WHEELS. <sup>2</sup> |                                  | KILOWATT<br>CAPACITY OF<br>DYNAMOS. |                                  | OUTPUT OF STATIONS,<br>KILOWATT HOURS. |                                  | LAMPS. <sup>3</sup> |                                  |                            |                                  |
|--------------------------------|--------------|-------------------------------|---------------------|-----------------------|-----------------|------------------------------------------------------------|----------------------------------|-------------------------------------|----------------------------------|----------------------------------------|----------------------------------|---------------------|----------------------------------|----------------------------|----------------------------------|
|                                |              |                               | Total.              | Com-<br>mer-<br>cial. | Munici-<br>pal. | Amount.                                                    | Per<br>1,000<br>popu-<br>lation. | Amount.                             | Per<br>1,000<br>popu-<br>lation. | Amount.                                | Per<br>1,000<br>popu-<br>lation. | Arc.                |                                  | Incandescent. <sup>4</sup> |                                  |
|                                |              |                               |                     |                       |                 |                                                            |                                  |                                     |                                  |                                        |                                  | Num-<br>ber.        | Per<br>1,000<br>popu-<br>lation. | Number.                    | Per<br>1,000<br>popu-<br>lation. |
| United States.....             | 1907         | 85,532,761                    | 4,714               | 3,462                 | 1,252           | 4,068,188                                                  | 47.91                            | 2,709,225                           | 31.67                            | 5,862,276,737                          | 68,538.38                        | 555,713             | 6.50                             | 41,445,997                 | 484.56                           |
|                                | 1902         | 78,576,436                    | 3,620               | 2,805                 | 815             | 1,845,048                                                  | 23.48                            | 1,212,235                           | 15.43                            | 2,507,051,115                          | 31,905.89                        | 385,698             | 4.91                             | 18,194,044                 | 231.55                           |
| Per cent of in-<br>crease..... |              | 8.9                           | 30.2                | 23.4                  | 53.6            | 122.1                                                      |                                  | 123.5                               |                                  | 133.8                                  |                                  | 44.1                |                                  | 127.8                      |                                  |
| North Atlantic.....            | 1907         | 23,779,013                    | 1,070               | 920                   | 150             | 1,534,586                                                  | 64.54                            | 1,054,528                           | 44.35                            | 2,483,106,227                          | 104,424.28                       | 242,320             | 10.19                            | 17,187,474                 | 722.80                           |
|                                | 1902         | 21,778,196                    | 913                 | 810                   | 103             | 814,728                                                    | 37.41                            | 517,549                             | 23.76                            | 1,269,331,001                          | 58,284.49                        | 169,554             | 7.79                             | 8,561,205                  | 393.11                           |
| Per cent of increase.....      |              | 9.2                           | 17.2                | 13.6                  | 45.6            | 88.4                                                       |                                  | 103.8                               |                                  | 95.6                                   |                                  | 42.9                |                                  | 100.8                      |                                  |
| South Atlantic.....            | 1907         | 11,574,988                    | 390                 | 232                   | 158             | 295,265                                                    | 25.51                            | 195,309                             | 16.87                            | 266,437,175                            | 23,018.35                        | 27,103              | 2.34                             | 1,915,725                  | 165.51                           |
|                                | 1902         | 10,770,414                    | 251                 | 176                   | 75              | 92,641                                                     | 8.60                             | 62,301                              | 5.78                             | 102,990,575                            | 9,562.36                         | 17,183              | 1.60                             | 611,001                    | 56.78                            |
| Per cent of increase.....      |              | 7.5                           | 55.4                | 31.8                  | 110.7           | 218.7                                                      |                                  | 213.5                               |                                  | 158.7                                  |                                  | 57.7                |                                  | 213.5                      |                                  |
| North Central.....             | 1907         | 29,026,645                    | 2,095               | 1,368                 | 727             | 1,219,916                                                  | 42.03                            | 805,012                             | 27.73                            | 1,462,114,001                          | 50,371.44                        | 204,248             | 7.04                             | 14,269,544                 | 491.60                           |
|                                | 1902         | 27,087,206                    | 1,706               | 1,178                 | 528             | 539,669                                                    | 19.92                            | 375,514                             | 13.86                            | 645,062,113                            | 23,814.27                        | 145,529             | 5.37                             | 6,176,919                  | 228.04                           |
| Per cent of increase.....      |              | 7.2                           | 22.8                | 16.1                  | 37.7            | 126.0                                                      |                                  | 114.4                               |                                  | 126.7                                  |                                  | 40.3                |                                  | 131.0                      |                                  |
| South Central.....             | 1907         | 16,368,558                    | 679                 | 513                   | 166             | 244,422                                                    | 14.93                            | 165,969                             | 10.14                            | 257,387,610                            | 15,724.51                        | 39,794              | 2.43                             | 2,697,115                  | 164.77                           |
|                                | 1902         | 14,651,535                    | 404                 | 323                   | 81              | 117,192                                                    | 8.00                             | 82,259                              | 56.14                            | 153,905,350                            | 10,504.38                        | 23,320              | 1.59                             | 1,022,298                  | 69.77                            |
| Per cent of increase.....      |              | 11.7                          | 68.1                | 58.8                  | 104.9           | 108.6                                                      |                                  | 101.8                               |                                  | 67.2                                   |                                  | 70.6                |                                  | 163.8                      |                                  |
| Western.....                   | 1907         | 4,783,557                     | 480                 | 429                   | 51              | 803,990                                                    | 168.08                           | 488,407                             | 102.10                           | 1,393,231,724                          | 291,254.34                       | 42,248              | 8.83                             | 5,376,139                  | 1,123.88                         |
|                                | 1902         | 4,289,085                     | 346                 | 318                   | 28              | 280,818                                                    | 65.47                            | 174,612                             | 40.71                            | 335,762,076                            | 78,282.91                        | 30,112              | 7.02                             | 1,822,621                  | 424.94                           |
| Per cent of increase.....      |              | 11.5                          | 38.7                | 34.9                  | 82.1            | 186.3                                                      |                                  | 179.7                               |                                  | 315.0                                  |                                  | 40.3                |                                  | 195.0                      |                                  |

<sup>1</sup> Based upon Bureau of the Census estimates.<sup>2</sup> Includes capacity of auxiliary engines, amounting to 65,823 horsepower in 1907 and 14,454 horsepower in 1902.<sup>3</sup> In 1907, exclusive of 162,338 lamps of "Other varieties—Nernst, vacuum, vapor, etc."—the revenue for which is included with the income for lighting, and 275,079 lamps used by the central stations to light their own electric properties. These lamps were not reported separately in 1902.<sup>4</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

The comparison of the population of these geographic divisions with the several items of Table 7 representing the equipment and output of the stations may be roughly summarized as follows: The North Central, one-third of all items; the North Atlantic, one-fourth of the population and two-fifths of the other items; the South Atlantic and South Central combined, one-third of the population and one-eighth of the other items; and the Western, one-twentieth of the population and one-sixth of the other items. Comparing the proportion of population with that for the number of stations, the proportion of stations was larger than that for population for the North Central and Western divisions, and smaller for the North Atlantic, South Atlantic, and South Central divisions.

One of the most pronounced features of the central-station industry is the large per capita showing for the Western division, the output of stations and all the items of equipment, except arc lamps, being the largest of any group. The Western division, having, in 1907, less than 5,000,000 population, as compared with a population of upward of 11,000,000 and 16,000,000 for the South Atlantic and South Central divisions, respectively, reported a greater primary horsepower, a larger dynamo capacity, and more incandescent lamps wired for service than the two latter divisions combined. In per capita showing, the North Atlantic division was second in rank, the North Central third, the South Atlantic fourth, and the South Central fifth.

Mention has already been made of the fact that numerous tables in the report for 1902 contained statistics for the central stations, grouped according

to the population of the places in which the stations were located. Such a presentation of the statistics is interesting, but the following points should be considered in connection with the results:

1. The reports for the central stations are assigned to the places in which the plants are located.

2. The development of the alternating current by means of the single-phase or polyphase dynamo, referred to in the report of 1902, has continued since that census, until at the census of 1907 the kilowatt capacity of this class of machines represented 82 per cent of the total dynamo capacity of all central stations. In many instances large plants are now located at places where water power is available for the generation of the current, but at great distances from the places where the current is used. It is evident that any attempt to arrive at the true per capita consumption of current, and other features based on population by localities, should include the statistics for these generating plants, but this is impossible, since they frequently furnish current to two or more widely separated cities, mills, or factories. The following are among the most notable examples of this phase of the development and use of electrical energy: In California two companies have plants located in several small places where water power is available for the generation of electricity, which is not only transmitted to the largest cities in the state but is used in numerous smaller places in the course of its transit. In New York the electrical energy generated at Niagara Falls is distributed to various cities and towns in the state. In South Carolina there is one large company with generating plants at places where there



is water power, from which places the electrical energy is transmitted to various sections of that state. If necessary, many other instances of this character of electric service might be given, but these are deemed sufficient for the purpose.

3. Some electric companies, though owning two or more central stations situated in widely separated places, made but one report covering all of their properties. As a rule, such reports are assigned to the place in which the principal plant is located. In some instances these plants are in two or more of the groups of cities for which separate statistics were shown in 1902, and the assignment of all of them to a certain city or group of cities would detract from the value of conclusions based upon population.

A majority of the central stations, however, are located in the cities to which they are assigned and where all of their output, or the major portion, is consumed. While, therefore, this grouping of the stations in 1902 by population may have been instructive to some extent, the defects are too great, so far as relates to the commercial stations, to warrant such an analysis at the census of 1907. Statistics are presented, however, for the following 34 selected cities, grouped in four classes according to size:

*Thirty-four selected cities grouped in four classes according to their estimated population in 1902.*

| 500,000 and over.                                                       | 100,000 but under 500,000.                                                                                                                                                                            | 25,000 but under 100,000.                                                                                                                                                       | 5,000 but under 25,000.                                                                                                                                                                |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chicago, Ill.<br>New York, N. Y.<br>Philadelphia, Pa.<br>St. Louis, Mo. | Cincinnati, Ohio.<br>Cleveland, Ohio.<br>Denver, Colo.<br>Indianapolis, Ind.<br>Louisville, Ky.<br>Minneapolis, Minn.<br>New Orleans, La.<br>St. Paul, Minn.<br>Washington, D. C.<br>Worcester, Mass. | Dayton, Ohio.<br>Des Moines, Iowa.<br>Duluth, Minn.<br>Erie, Pa.<br>Evansville, Ind.<br>Holyoke, Mass.<br>Mobile, Ala.<br>Reading, Pa.<br>San Antonio, Tex.<br>Wilmington, Del. | Anderson, Ind.<br>Cumberland, Md.<br>Flint, Mich.<br>Hannibal, Mo.<br>Lewiston, Me.<br>Northampton, Mass.<br>Oklahoma City, Okla.<br>Paducah, Ky.<br>Richmond, Ind.<br>Shreveport, La. |

In the selection of these 34 cities, the rule followed was to limit them to those in which all the electrical energy used was practically generated within their respective limits and but little, if any, sold for outside consumption. Although the selection was to some extent an arbitrary one, the cities are fairly representative of the various sections of the country. These 34 cities contained 75 stations in 1907 and 70 stations in 1902, the character of ownership of which in 1907 was as follows: Corporate, 61; and municipal, 14. In 1902, 58 were corporate; 11, municipal; and 1, individual.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 8.—CENTRAL ELECTRIC STATIONS IN 34 SELECTED CITIES, BY GROUPS, ACCORDING TO POPULATION: 1907 AND 1902.

[The cities are grouped according to their estimated population in 1902, in order that the groups for the two census years may be identical.]

|                                                 | THIRTY-FOUR CITIES. |               |                       | FOUR CITIES, EACH HAVING A POPULATION OF 500,000 AND OVER. |               |                       |
|-------------------------------------------------|---------------------|---------------|-----------------------|------------------------------------------------------------|---------------|-----------------------|
|                                                 | 1907                | 1902          | Per cent of increase. | 1907                                                       | 1902          | Per cent of increase. |
| Population <sup>1</sup> .....                   | 12,088,994          | 10,546,858    | 14.6                  | 8,461,375                                                  | 7,381,590     | 14.6                  |
| Number of stations.....                         | 75                  | 70            | 7.1                   | 24                                                         | 22            | 9.1                   |
| Stock outstanding.....                          | \$186,133,534       | \$136,115,960 | 36.7                  | \$132,860,984                                              | \$105,086,650 | 26.4                  |
| Dividends.....                                  | \$7,017,001         | \$1,857,305   | 277.8                 | \$5,232,927                                                | \$1,033,534   | 406.3                 |
| Bonds outstanding.....                          | \$181,078,998       | \$108,571,502 | 66.8                  | \$135,130,386                                              | \$93,030,502  | 45.3                  |
| Cost of construction and equipment.....         | \$338,870,083       | \$133,825,427 | 153.2                 | \$240,009,024                                              | \$91,212,353  | 163.1                 |
| Gross income.....                               | \$53,242,154        | \$25,126,735  | 111.9                 | \$38,868,287                                               | \$18,087,346  | 114.9                 |
| Electric service.....                           | \$52,039,498        | \$24,958,991  | 108.4                 | \$37,922,680                                               | \$18,073,643  | 109.8                 |
| Lighting.....                                   | \$39,583,359        | \$20,833,882  | 90.0                  | \$28,409,863                                               | \$15,051,352  | 88.8                  |
| Stationary motors.....                          | \$9,397,205         | \$3,919,455   | 139.8                 | \$6,894,775                                                | \$2,958,604   | 133.0                 |
| All other.....                                  | \$3,058,934         | \$215,654     | 1,318.4               | \$2,618,042                                                | \$63,687      | 4,010.8               |
| All other sources.....                          | \$1,202,656         | \$157,744     | 662.4                 | \$945,607                                                  | \$13,703      | 6,800.7               |
| Total expenses.....                             | \$29,753,204        | \$15,282,933  | 94.7                  | \$20,435,942                                               | \$10,755,734  | 90.5                  |
| Cost of supplies and materials.....             | \$3,784,641         | \$2,952,346   | 28.2                  | \$2,337,290                                                | \$2,181,129   | 7.2                   |
| Cost of fuel.....                               | \$5,527,510         | \$2,493,049   | 121.7                 | \$3,647,844                                                | \$1,656,792   | 120.2                 |
| Power purchased.....                            | \$1,121,079         | \$213,929     | 424.0                 | \$688,281                                                  | \$15,700      | 4,156.6               |
| Miscellaneous expenses.....                     | \$10,130,039        | \$4,184,971   | 142.1                 | \$7,246,844                                                | \$2,916,276   | 148.5                 |
| Salaries and wages.....                         | \$9,189,935         | \$5,438,638   | 69.0                  | \$6,535,683                                                | \$3,988,837   | 65.2                  |
| Salaries officials, clerks, etc.:.....          |                     |               |                       |                                                            |               |                       |
| Number.....                                     | 2,568               | 1,219         | 110.7                 | 1,895                                                      | 849           | 123.2                 |
| Salaries.....                                   | \$2,851,745         | \$1,291,172   | 120.9                 | \$2,104,888                                                | \$924,128     | 127.8                 |
| Wage-earners:.....                              |                     |               |                       |                                                            |               |                       |
| Average number.....                             | 9,000               | 5,727         | 57.2                  | 6,092                                                      | 4,071         | 49.6                  |
| Wages.....                                      | \$6,338,190         | \$4,147,466   | 52.8                  | \$4,480,795                                                | \$3,061,709   | 46.3                  |
| Primary power: <sup>2</sup> .....               |                     |               |                       |                                                            |               |                       |
| Number of machines.....                         | 585                 | 485           | 20.6                  | 278                                                        | 234           | 17.9                  |
| Horsepower capacity.....                        | 908,776             | 338,461       | 168.5                 | 578,120                                                    | 212,990       | 171.4                 |
| Generating equipment:.....                      |                     |               |                       |                                                            |               |                       |
| Number of dynamos.....                          | 979                 | 1,584         | *38.2                 | 480                                                        | 925           | *50.3                 |
| Kilowatt capacity.....                          | 639,195             | 218,688       | 192.3                 | 415,979                                                    | 133,247       | 212.2                 |
| Output of stations, kilowatt hours.....         | 1,337,608,288       | 479,132,378   | 179.2                 | 969,516,589                                                | 308,435,153   | 226.1                 |
| Lamps wired for service: <sup>3</sup> .....     |                     |               |                       |                                                            |               |                       |
| Arc.....                                        | 183,731             | 111,437       | 64.9                  | 120,169                                                    | 70,376        | 70.8                  |
| Incandescent <sup>4</sup> .....                 | 11,522,603          | 5,484,938     | 110.1                 | 7,833,601                                                  | 4,069,473     | 92.5                  |
| Other varieties—Nernst, vacuum, vapor, etc..... | 56,391              | (*)           |                       | 40,779                                                     | (*)           |                       |

|                                                 | TEN CITIES, EACH HAVING A POPULATION OF 100,000 BUT UNDER 500,000. |              |                       | TEN CITIES, EACH HAVING A POPULATION OF 25,000 BUT UNDER 100,000. |             |                       | TEN CITIES, EACH HAVING A POPULATION OF 5,000 BUT UNDER 25,000. |             |                       |
|-------------------------------------------------|--------------------------------------------------------------------|--------------|-----------------------|-------------------------------------------------------------------|-------------|-----------------------|-----------------------------------------------------------------|-------------|-----------------------|
|                                                 | 1907                                                               | 1902         | Per cent of increase. | 1907                                                              | 1902        | Per cent of increase. | 1907                                                            | 1902        | Per cent of increase. |
| Population <sup>1</sup> .....                   | 2,603,310                                                          | 2,354,704    | 14.4                  | 719,613                                                           | 632,582     | 13.8                  | 214,696                                                         | 177,992     | 20.6                  |
| Number of stations.....                         | 23                                                                 | 24           | 14.2                  | 15                                                                | 12          | 25.0                  | 13                                                              | 12          | 8.3                   |
| Stock outstanding.....                          | \$37,739,990                                                       | \$26,490,600 | 42.5                  | \$13,105,760                                                      | \$3,855,000 | 240.0                 | \$2,427,400                                                     | \$683,700   | 255.0                 |
| Dividends.....                                  | \$1,471,999                                                        | \$709,775    | 107.3                 | \$253,200                                                         | \$106,300   | 138.2                 | \$59,775                                                        | \$7,096     | 676.7                 |
| Bonds outstanding.....                          | \$27,490,900                                                       | \$12,058,500 | 128.0                 | \$15,208,712                                                      | \$2,884,000 | 427.3                 | \$3,249,000                                                     | \$598,500   | 442.9                 |
| Cost of construction and equipment.....         | \$69,756,748                                                       | \$34,512,803 | 102.1                 | \$24,296,933                                                      | \$7,007,488 | 246.7                 | \$4,807,378                                                     | \$1,092,783 | 339.9                 |
| Gross income.....                               | \$10,676,131                                                       | \$5,236,059  | 103.9                 | \$2,739,816                                                       | \$1,436,751 | 90.7                  | \$957,420                                                       | \$366,579   | 161.2                 |
| Electric service.....                           | \$10,520,106                                                       | \$5,155,661  | 104.1                 | \$2,678,781                                                       | \$1,376,328 | 94.6                  | \$917,531                                                       | \$363,359   | 152.5                 |
| Lighting.....                                   | \$8,360,722                                                        | \$4,236,520  | 97.3                  | \$2,078,740                                                       | \$1,214,683 | 71.1                  | \$734,034                                                       | \$331,327   | 121.5                 |
| Stationary motors.....                          | \$1,964,718                                                        | \$783,567    | 150.7                 | \$417,766                                                         | \$151,013   | 176.6                 | \$119,946                                                       | \$26,271    | 356.6                 |
| All other.....                                  | \$195,666                                                          | \$135,574    | 43.9                  | \$182,275                                                         | \$10,632    | 1,614.4               | \$63,551                                                        | \$5,761     | 1,000.3               |
| All other sources.....                          | \$156,125                                                          | \$80,398     | 94.2                  | \$61,035                                                          | \$60,423    | 1.0                   | \$39,889                                                        | \$3,220     | 1,138.8               |
| Total expenses.....                             | \$6,836,662                                                        | \$3,355,435  | 103.7                 | \$1,820,351                                                       | \$935,969   | 94.5                  | \$610,349                                                       | \$235,785   | 158.8                 |
| Cost of supplies and materials.....             | \$1,101,472                                                        | \$554,705    | 98.6                  | \$284,886                                                         | \$180,875   | 57.5                  | \$60,993                                                        | \$35,637    | 71.2                  |
| Cost of fuel.....                               | \$1,237,747                                                        | \$627,804    | 97.2                  | \$447,154                                                         | \$141,820   | 215.3                 | \$194,765                                                       | \$66,633    | 192.3                 |
| Power purchased.....                            | \$229,526                                                          | \$106,990    | 114.5                 | \$219,525                                                         | \$91,239    | 140.6                 | \$3,747                                                         |             |                       |
| Miscellaneous expenses.....                     | \$2,346,009                                                        | \$995,084    | 135.8                 | \$378,083                                                         | \$235,083   | 60.8                  | \$158,503                                                       | \$38,528    | 311.4                 |
| Salaries and wages.....                         | \$1,921,208                                                        | \$1,070,852  | 79.4                  | \$490,703                                                         | \$286,952   | 71.0                  | \$192,341                                                       | \$94,997    | 102.5                 |
| Salaries officials, clerks, etc.:.....          |                                                                    |              |                       |                                                                   |             |                       |                                                                 |             |                       |
| Number.....                                     | 433                                                                | 255          | 69.8                  | 171                                                               | 76          | 125.0                 | 69                                                              | 39          | 76.9                  |
| Salaries.....                                   | \$523,893                                                          | \$252,702    | 107.3                 | \$160,116                                                         | \$84,407    | 89.7                  | \$62,848                                                        | \$29,935    | 109.9                 |
| Wage-earners:.....                              |                                                                    |              |                       |                                                                   |             |                       |                                                                 |             |                       |
| Average number.....                             | 2,163                                                              | 1,255        | 72.4                  | 544                                                               | 292         | 86.3                  | 201                                                             | 109         | 84.4                  |
| Wages.....                                      | \$1,397,315                                                        | \$818,150    | 70.8                  | \$330,587                                                         | \$202,545   | 63.2                  | \$129,493                                                       | \$65,062    | 99.0                  |
| Primary power: <sup>2</sup> .....               |                                                                    |              |                       |                                                                   |             |                       |                                                                 |             |                       |
| Number of machines.....                         | 174                                                                | 153          | 13.7                  | 94                                                                | 62          | 51.6                  | 41                                                              | 36          | 13.9                  |
| Horsepower capacity.....                        | 218,178                                                            | 91,916       | 126.5                 | 93,982                                                            | 24,650      | 281.3                 | 18,496                                                          | 8,905       | 107.7                 |
| Generating equipment:.....                      |                                                                    |              |                       |                                                                   |             |                       |                                                                 |             |                       |
| Number of dynamos.....                          | 292                                                                | 432          | *32.4                 | 160                                                               | 150         | 6.7                   | 67                                                              | 77          | *12.0                 |
| Kilowatt capacity.....                          | 147,439                                                            | 64,147       | 129.8                 | 62,603                                                            | 16,210      | 286.2                 | 13,174                                                          | 5,084       | 159.1                 |
| Output of stations, kilowatt hours.....         | 249,286,502                                                        | 119,533,836  | 108.5                 | 73,547,640                                                        | 35,156,654  | 109.2                 | 25,257,557                                                      | 21,006,735  | 20.2                  |
| Lamps wired for service: <sup>3</sup> .....     |                                                                    |              |                       |                                                                   |             |                       |                                                                 |             |                       |
| Arc.....                                        | 47,308                                                             | 30,792       | 53.6                  | 11,958                                                            | 7,431       | 60.9                  | 4,296                                                           | 2,838       | 51.4                  |
| Incandescent <sup>4</sup> .....                 | 2,769,920                                                          | 1,112,946    | 148.9                 | 703,211                                                           | 231,114     | 204.3                 | 215,811                                                         | 71,405      | 202.2                 |
| Other varieties—Nernst, vacuum, vapor, etc..... | 5,083                                                              | (*)          |                       | 10,211                                                            | (*)         |                       | 318                                                             | (*)         |                       |

<sup>1</sup> Based upon Bureau of the Census estimates.<sup>2</sup> Decrease.<sup>3</sup> Exclusive of auxiliary engines with a total capacity of 10,659 horsepower in 1907 and 3,562 horsepower in 1902.<sup>4</sup> Exclusive of 52,020 lamps used by the central stations to light their own electric properties in 1907. These lamps were not reported separately in 1902.<sup>5</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.<sup>6</sup> Not reported separately.

While the principal income of central stations is derived from lighting and stationary-motor service, electricity is being used for a constantly increasing variety of purposes. The income as reported from these miscellaneous uses is shown in Table 8 as "All other" under "Electric service." The several items composing this total are shown in Table 9.

TABLE 9.—Central electric stations in 34 selected cities—Income from "All other electric service:" 1907 and 1902.

|                                        | 1907        | 1902      | Per cent of increase. |
|----------------------------------------|-------------|-----------|-----------------------|
| Total.....                             | \$3,068,934 | \$215,654 | 1,318.4               |
| Electric-railway service.....          | 1,960,551   | 138,275   | 1,317.9               |
| Sales to other electric companies..... | 779,728     |           |                       |
| Heating, cooking, welding, etc.....    | 117,560     | 23,451    | 401.3                 |
| Charging automobiles.....              | 135,121     | 24,775    | 445.4                 |
| Miscellaneous electric service.....    | 65,974      | 29,153    | 126.3                 |

More than nine-tenths of the gain in "Other electric service" was from the sale of current to electric-railway companies and to other companies engaged in the sale and distribution of current. The percentages of increase for the remaining items are large, but the actual amounts of income involved are comparatively small. The greater part of the income from "Miscellaneous electric service" was derived from the use of current to operate electric fans.

Although not shown in Table 8, certain facts connected with the generating plants in the 34 cities are briefly summarized, as follows: In 1907 nearly one-fourth of the primary power for the 4,714 central stations in the United States was connected with the 75 stations in these selected cities. The proportion of steam power in the total primary power in these cities was 92.5 per cent in 1907 and 98.7 per cent in 1902, as compared with 65.2 per cent and 75.4 per cent, respectively, for the United States. As illustrative of the extensive use of the steam turbine in the more thickly settled communities, 55.6 per cent of the total horsepower reported for steam turbines in the central stations in the United States was reported by the stations in these 34 selected cities. Chicago claims the distinction of having the largest prime mover in the world, a steam turbine of 22,000 horsepower, several more of which are about to be installed in the same station. The gas engine was very little used in these cities, only 4 engines with a total of 60 horsepower being reported in 1907, all in the group of cities of over 500,000 population. In 1902 the group of cities "5,000 but under 25,000" was the only one not reporting gas engines, although but 300 horsepower of this character was reported for the 34 cities, which formed only one-tenth of 1 per cent of the total for all kinds of primary power. A considerable increase in water power is shown, from 1.2 per cent in 1902 to 7.6 per cent in 1907. No water power was reported in the 4 cities of over 500,000 population, but it is shown for each of the remaining groups. The increase in water

power was not due to the general adoption of this form of primary power, as nearly nine-tenths of the total increase was confined to two companies, one in the group of cities of 100,000 but under 500,000 population, where the water power increased from 2,400 horsepower in 1902 to 19,600 horsepower in 1907, and the other in the group of cities of 25,000 but under 100,000 population, in which there has been installed since 1902 a plant reporting water wheels of 39,700 horsepower. Although this latter plant was reported in 1907, it had been in operation but a few months and at only a fraction of the capacity reported.

Exclusive of the horsepower of the gas engines, which was comparatively insignificant, the horsepower capacity reported by all central stations in the United States in 1907 was about two-thirds steam and one-third water. In 1902 the proportions were about three-fourths steam and one-fourth water. For the 34 cities in 1907 more than nine-tenths was steam and less than one-tenth water, while in 1902 practically all the primary power was steam.

The generating equipment for the 34 selected cities, which is reported in bulk in Table 8, is shown in detail in Table 10.

TABLE 10.—Central electric stations in 34 selected cities—Generating equipment: 1907 and 1902.

| KIND OF DYNAMO.                                 | Census.      | Thirty-four cities. | Four cities, each having a population of 500,000 and over. | Ten cities, each having a population of 100,000 but under 500,000. | Ten cities, each having a population of 25,000 but under 100,000. | Ten cities, each having a population of 5,000 but under 25,000. |
|-------------------------------------------------|--------------|---------------------|------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|
| Number of stations.....                         | 1907<br>1902 | 75<br>70            | 24<br>22                                                   | 23<br>24                                                           | 15<br>12                                                          | 13<br>12                                                        |
| Dynamos:                                        |              |                     |                                                            |                                                                    |                                                                   |                                                                 |
| Number.....                                     | 1907<br>1902 | 979<br>1,584        | 460<br>925                                                 | 292<br>432                                                         | 160<br>150                                                        | 67<br>77                                                        |
| Kilowatt capacity.....                          | 1907<br>1902 | 639,195<br>218,088  | 415,979<br>133,247                                         | 147,439<br>64,147                                                  | 62,003<br>16,210                                                  | 13,174<br>5,064                                                 |
| Direct-current, constant-voltage:               |              |                     |                                                            |                                                                    |                                                                   |                                                                 |
| Number.....                                     | 1907<br>1902 | 312<br>432          | 125<br>192                                                 | 96<br>150                                                          | 70<br>64                                                          | 21<br>26                                                        |
| Kilowatt capacity.....                          | 1907<br>1902 | 95,956<br>94,552    | 38,964<br>50,927                                           | 40,275<br>34,943                                                   | 13,798<br>7,207                                                   | 2,890<br>1,475                                                  |
| Direct-current, constant-amperage:              |              |                     |                                                            |                                                                    |                                                                   |                                                                 |
| Number.....                                     | 1907<br>1902 | 385<br>702          | 218<br>401                                                 | 109<br>210                                                         | 41<br>60                                                          | 17<br>31                                                        |
| Kilowatt capacity.....                          | 1907<br>1902 | 23,748<br>37,222    | 15,505<br>22,287                                           | 5,579<br>11,214                                                    | 2,069<br>2,703                                                    | 565<br>1,018                                                    |
| Alternating single-phase and polyphase current: |              |                     |                                                            |                                                                    |                                                                   |                                                                 |
| Number.....                                     | 1907<br>1902 | 282<br>450          | 117<br>332                                                 | 87<br>72                                                           | 49<br>26                                                          | 29<br>20                                                        |
| Kilowatt capacity.....                          | 1907<br>1902 | 519,491<br>86,914   | 361,490<br>60,033                                          | 101,585<br>17,990                                                  | 46,736<br>6,300                                                   | 9,680<br>2,591                                                  |

The kilowatt capacity of the dynamos in the 34 selected cities formed about the same proportion of the total for the United States, slightly less than one-fourth, as did the primary power. The percentage of increase, however, was considerably larger for the 34 cities than for the United States. The kilowatt

capacity of the direct-current, constant-voltage dynamos, which increased 23.1 per cent in the United States, practically remained stationary in the total for the 34 cities, the increase being less than 2 per cent. An actual loss is shown for the 4 cities of largest population, which, however, is slightly overcome by gains in each of the other three groups. The capacity of the direct-current, constant-amperage dynamo decreased in each of the several groups of cities, in harmony with the decrease shown for this class of dynamo in the total for the United States. The capacity of the alternating single-phase and polyphase current dynamo increased in each group, and the percentage of gain for the 34 cities together was much greater than that for the country as a whole.

Notwithstanding the gain in kilowatt capacity of the dynamos there was a general decrease in their number, which fact harmonizes with the conclusions in the chapter treating of the generating equipment of all central stations, where the average capacity of

the dynamos in 1907 is shown to be much larger than was reported in 1902.

*Large and small stations.*—As previously explained, the classification of "central station" is based on the character of the service and not on the size of the plant. No limit was placed on the size of the plants to be enumerated, and although there are some very large stations, the vast majority are comparatively small. The commercial stations range from the one located at Stanton, Iowa, with gas as the primary power and a dynamo of 3-kilowatt capacity, to one in New York City having steam as the primary power and a total dynamo capacity of 149,300 kilowatts. The municipal stations range from the one located at Bath, Ill., also with gas as the primary power and a dynamo capacity of 6 kilowatts, to that located at Chicago, with steam as the primary power and a total dynamo capacity of 5,473 kilowatts. Table 11 classifies the stations according to dynamo capacity.

TABLE 11.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

| DYNAMO CAPACITY OF STATION.                  | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |      | PER CENT DISTRIBUTION. |       |             |       |            |       |
|----------------------------------------------|--------|-------|-------------|-------|------------|------|------------------------|-------|-------------|-------|------------|-------|
|                                              |        |       |             |       |            |      | Total.                 |       | Commercial. |       | Municipal. |       |
|                                              | 1907   | 1902  | 1907        | 1902  | 1907       | 1902 | 1907                   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total.....                                   | 4,714  | 3,620 | 3,462       | 2,805 | 1,252      | 815  | 100.0                  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Under 200 kilowatts.....                     | 3,038  | 2,587 | 2,116       | 1,890 | 922        | 697  | 64.4                   | 71.5  | 61.1        | 67.4  | 73.6       | 85.5  |
| 200 but under 500 kilowatts.....             | 821    | 586   | 584         | 497   | 237        | 89   | 17.4                   | 16.2  | 16.9        | 17.7  | 18.9       | 10.9  |
| 500 but under 1,000 kilowatts.....           | 269    | 172   | 225         | 160   | 44         | 12   | 5.7                    | 4.8   | 6.5         | 5.7   | 3.5        | 1.5   |
| 1,000 but under 2,000 kilowatts.....         | 169    | 98    | 159         | 92    | 10         | 6    | 3.6                    | 2.7   | 4.6         | 3.3   | 0.8        | 0.7   |
| 2,000 but under 5,000 kilowatts.....         | 115    | 66    | 111         | 64    | 4          | 2    | 2.4                    | 1.8   | 3.2         | 2.3   | 0.3        | 0.2   |
| 5,000 kilowatts and over.....                | 75     | 33    | 74          | 32    | 1          | 1    | 1.6                    | 0.9   | 2.1         | 1.1   | 0.1        | 0.1   |
| Stations having no generating equipment..... | 227    | 78    | 193         | 70    | 34         | 8    | 4.8                    | 2.2   | 5.6         | 2.5   | 2.7        | 1.0   |

The extent of the predominance of the small station is evident from the fact that 81.8 per cent of all stations in 1907 and 87.7 per cent in 1902 were under 500-kilowatt capacity, while considerably more than one-half of all, 64.4 per cent in 1907 and 71.5 per cent in 1902, were under 200-kilowatt capacity. As would be expected, the number of stations in the various classes grows proportionately less as the classes increase in dynamo capacity.

Of the commercial stations, 16.4 per cent in 1907 and 12.4 per cent in 1902 were embraced in the classes which had a kilowatt capacity of 500 horsepower or over, while of the municipal stations, only 4.7 per cent in 1907 and 2.5 per cent in 1902 reported this capacity. Although the percentages of increase are almost uniformly larger for the municipal stations, in but one class, that of "200 but under 500 kilowatts," was the actual increase the greater. The commercial stations made the only increase in the class of largest dynamo capacity, there being but one municipal

station of this class both in 1907 and 1902, which was located in Chicago. Except for a small amount of current sold to other electric companies, this plant was engaged exclusively in arc lighting.

The distribution, by dynamo capacity, of the purely electric and of the composite stations is shown in Table 12.

For all the stations supplied with dynamos the percentages of increase were uniformly greater for the composite stations. In this group the proportion of small stations, or those under 500-kilowatt capacity, was 83.8 per cent in 1907 and 89.8 per cent in 1902 as compared with 80.4 and 86.2 per cent, respectively, for the purely electric. Among the purely electric stations the larger plants are a little more numerous, relatively, than among the composite stations. It appears, however, that the manufacture of electric current on a large scale is combined with other lines of work almost as much as the manufacture of current on a small scale.

TABLE 12.—PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—NUMBER, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

| DYNAMO CAPACITY OF STATION.                  | TOTAL. |       | PURELY ELECTRIC. |       | COMPOSITE. |       | PER CENT DISTRIBUTION. |       |                  |       |            |       |
|----------------------------------------------|--------|-------|------------------|-------|------------|-------|------------------------|-------|------------------|-------|------------|-------|
|                                              |        |       |                  |       |            |       | Total.                 |       | Purely electric. |       | Composite. |       |
|                                              | 1907   | 1902  | 1907             | 1902  | 1907       | 1902  | 1907                   | 1902  | 1907             | 1902  | 1907       | 1902  |
| Total.....                                   | 4,714  | 3,620 | 2,648            | 2,139 | 2,066      | 1,481 | 100.0                  | 100.0 | 100.0            | 100.0 | 100.0      | 100.0 |
| Under 200 kilowatts.....                     | 3,038  | 2,587 | 1,692            | 1,477 | 1,346      | 1,110 | 64.4                   | 71.5  | 63.9             | 69.1  | 65.2       | 74.9  |
| 200 but under 500 kilowatts.....             | 821    | 586   | 436              | 366   | 385        | 220   | 17.4                   | 16.2  | 16.5             | 17.1  | 18.6       | 14.9  |
| 500 but under 1,000 kilowatts.....           | 269    | 172   | 140              | 96    | 129        | 76    | 5.7                    | 4.8   | 5.3              | 4.5   | 6.2        | 5.1   |
| 1,000 but under 2,000 kilowatts.....         | 169    | 98    | 80               | 69    | 89         | 29    | 3.6                    | 2.7   | 3.0              | 3.2   | 4.3        | 2.0   |
| 2,000 but under 5,000 kilowatts.....         | 115    | 66    | 70               | 48    | 45         | 18    | 2.4                    | 1.8   | 2.6              | 2.2   | 2.2        | 1.2   |
| 5,000 kilowatts and over.....                | 75     | 33    | 48               | 23    | 27         | 10    | 1.6                    | 0.9   | 1.8              | 1.1   | 1.3        | 0.7   |
| Stations having no generating equipment..... | 227    | 78    | 182              | 60    | 45         | 18    | 4.8                    | 2.2   | 6.9              | 2.8   | 2.2        | 1.2   |

The distribution of the stations by dynamo capacity is shown by geographic divisions in Table 13.

The Western division, although having in 1907 less than one-half the population of any of the other divisions, had more stations of 1,000-kilowatt capacity and over than either the South Atlantic or the South Central divisions, and in the largest class of 5,000 and over, nearly double the number for these two divisions combined. Another noticeable feature connected with the Western division is the relatively large number of stations not equipped with dynamos, being exceeded in this respect only by the North Atlantic division. In 1907, although not shown in Table 13, there were

4 states each of which had more than ten stations not possessing electric generators, as follows: California, 40; New York, 30; Pennsylvania, 30; and Massachusetts, 18. In 1902 such stations were reported by these states as follows: California, 25; New York, 4; Pennsylvania, 11; and Massachusetts, 5. These figures show that California had considerably the largest number of stations dependent upon other plants for their electrical energy, and this showing may be explained by the fact that in this state exceptionally long transmission lines are used, the electricity in one instance being generated upward of 200 miles from the places where it is chiefly used.

TABLE 13.—CENTRAL ELECTRIC STATIONS—NUMBER, BY DYNAMO CAPACITY AND BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

| DIVISION.           | TOTAL. |       | UNDER 200 KILOWATTS. |       | 200 BUT UNDER 500 KILOWATTS. |      | 500 BUT UNDER 1,000 KILOWATTS. |      | 1,000 BUT UNDER 2,000 KILOWATTS. |      | 2,000 BUT UNDER 5,000 KILOWATTS. |      | 5,000 KILOWATTS. AND OVER. |      | STATIONS HAVING NO GENERATING EQUIPMENT. |      |
|---------------------|--------|-------|----------------------|-------|------------------------------|------|--------------------------------|------|----------------------------------|------|----------------------------------|------|----------------------------|------|------------------------------------------|------|
|                     |        |       |                      |       |                              |      |                                |      |                                  |      |                                  |      |                            |      |                                          |      |
|                     | 1907   | 1902  | 1907                 | 1902  | 1907                         | 1902 | 1907                           | 1902 | 1907                             | 1902 | 1907                             | 1902 | 1907                       | 1902 | 1907                                     | 1902 |
| Total.....          | 4,714  | 3,620 | 3,038                | 2,587 | 821                          | 586  | 269                            | 172  | 169                              | 98   | 115                              | 66   | 75                         | 33   | 227                                      | 78   |
| North Atlantic..... | 1,070  | 913   | 491                  | 499   | 224                          | 216  | 113                            | 86   | 76                               | 42   | 50                               | 26   | 27                         | 15   | 99                                       | 29   |
| South Atlantic..... | 390    | 251   | 250                  | 201   | 90                           | 35   | 11                             | 4    | 10                               | 2    | 8                                | 6    | 7                          | 1    | 14                                       | 2    |
| North Central.....  | 2,095  | 1,706 | 1,527                | 1,347 | 346                          | 241  | 95                             | 60   | 47                               | 25   | 27                               | 19   | 20                         | 6    | 33                                       | 8    |
| South Central.....  | 679    | 404   | 530                  | 328   | 98                           | 48   | 20                             | 11   | 11                               | 10   | 12                               | 4    | 3                          | 1    | 5                                        | 2    |
| Western.....        | 480    | 346   | 250                  | 212   | 63                           | 46   | 30                             | 11   | 25                               | 19   | 18                               | 11   | 18                         | 10   | 76                                       | 37   |

*Consolidation of electric stations with other enterprises.*—In 1907 an effort was made to ascertain the extent of the association of other industries with central electric stations, and the results are presented in the following statement:

*Commercial and municipal central electric stations—Number and kind of associated enterprises: 1907.*

|                                   | Total. | Commer-<br>cial. | Munici-<br>pal. |
|-----------------------------------|--------|------------------|-----------------|
| United States.....                | 4,714  | 3,462            | 1,252           |
| Purely electric.....              | 2,648  | 2,127            | 521             |
| Composite.....                    | 2,066  | 1,335            | 731             |
| Total associated enterprises..... | 2,306  | 1,568            | 738             |
| Waterworks.....                   | 1,036  | 320              | 716             |
| Gas plants <sup>1</sup> .....     | 329    | 317              | 12              |
| Lumber and grist mills.....       | 310    | 307              | 3               |
| Ice manufacture.....              | 212    | 212              |                 |
| Steam heating.....                | 118    | 114              | 4               |
| Cotton gins.....                  | 35     | 35               |                 |
| Electric railways.....            | 32     | 32               |                 |
| Miscellaneous.....                | 234    | 231              | 3               |

<sup>1</sup> Manufactured gas.

Of the 4,714 central electric stations, the composite central stations, or those which were operated in connection with other industries, numbered 2,066. These stations were associated with 2,306 industries of various kinds, the excess of industries being due to the fact that a single central station may be associated with several other industries. The association of central stations with waterworks and gas plants is the most common, and for the municipal plants there was practically no other. For the commercial stations there were 995 operated in connection with such public service as waterworks, gas works, street railways, steam heating, and the manufacture of ice, and 573 stations operated in connection with some other business. The central stations associated with such industries as sawmills, gristmills, manufactured ice, and cotton gins, are likely to be of secondary importance, and owe their existence to the facility with which surplus primary power, by use of the

dynamo, may be converted into electrical energy and transmitted for service as light or power to near-by or remote points.

Of the various industries mentioned, the manu-

facture of illuminating gas comes into the most direct competition with the generation of electrical energy, and a comparative summary of the two industries is shown in Table 14.

TABLE 14.—COMPARATIVE SUMMARY—CENTRAL ELECTRIC STATIONS AND GAS PLANTS.

|                                                             | CENTRAL ELECTRIC STATIONS. |               | GAS PLANTS.   |               | PER CENT OF INCREASE.      |             |
|-------------------------------------------------------------|----------------------------|---------------|---------------|---------------|----------------------------|-------------|
|                                                             | 1907                       | 1902          | 1905          | 1900          | Central electric stations. | Gas plants. |
| Number of establishments.....                               | 4,714                      | 3,620         | 1,019         | 877           | 30.2                       | 16.2        |
| Cost of construction and equipment.....                     | \$1,096,913,622            | \$504,740,352 | \$725,035,204 | \$567,000,506 | 117.3                      | 27.9        |
| Gross income.....                                           | \$175,642,338              | \$85,700,605  | \$125,144,945 | \$75,716,693  | 104.9                      | 65.3        |
| From sale of electric current or gas.....                   | \$169,614,691              | \$84,186,605  | \$112,662,568 | \$69,432,582  | 101.5                      | 62.3        |
| From all other sources.....                                 | \$6,027,647                | \$1,514,000   | \$12,482,377  | \$6,284,111   | 298.1                      | 98.6        |
| Cost of supplies, materials, power purchased, and fuel..... | \$44,458,568               | \$22,915,932  | \$37,180,066  | \$20,605,356  | 94.0                       | 80.4        |
| Salaried officials, etc.:<br>Number.....                    | 12,990                     | 6,996         | 9,406         | 5,904         | 85.7                       | 59.3        |
| Salaries.....                                               | \$11,733,787               | \$5,663,580   | \$8,463,699   | \$5,273,500   | 107.2                      | 60.5        |
| Wage-earners:<br>Average number.....                        | 34,642                     | 23,330        | 30,566        | 22,459        | 48.5                       | 36.1        |
| Wages.....                                                  | \$23,686,537               | \$14,983,112  | \$17,057,917  | \$12,436,296  | 58.1                       | 37.2        |

<sup>1</sup>Capital invested—owned and borrowed.

Although the statistics for the two industries in Table 14 do not cover the same years, they represent the results of two censuses taken at five-year intervals, the respective census years being sufficiently near together for purposes of general comparison. The respective costs of construction for the two industries are based upon too widely different constituents to warrant their use except as they show the comparative growth of each industry. This item for electric stations represents the total cost of plants and equipment, and that for the gas plants embraces the capital invested—owned and borrowed. The percentages of increase for the central stations are uniformly greater than for the gas plants, although those for the latter industry are surprisingly large considering the competition of the newer industry.

The item most comparable is that which represents the income from the sale of electrical energy in one industry and from the sale of gas in the other. The income represented by this item not only constitutes in each industry more than 90 per cent of the total from all sources, but the chief uses of the electricity and manufactured gas are for identical purposes. A comparison of this source of income shows an increase of 101.5 per cent for the central stations and 62.3 per cent for the gas plants. It is to be remembered that the census figures for central stations in Table 14 do not embrace all that properly belongs to the central-station industry, since electric-railway companies sell electric current, amounting in 1907 to upward of \$20,000,000 worth, and thousands of isolated private stations exist which were not included in the census. There are likewise many isolated private gas plants, but the number is believed to be insignificant compared with the isolated electric plants.

In 1907, 329 stations reported that they also operated gas plants, but this by no means represents the

extent to which the consolidation of the interests of the two industries has been carried, since it does not cover instances wherein the whole, or a controlling portion, of the stock of one industry has been acquired, by the other, and the companies are operated under separate management regardless of stock ownership. There is a growing tendency to merge the two industries partly to avoid the sharp competition whenever they are common bidders for the same class of business.

#### MUNICIPAL PLANTS.

A comparison of the number of reports received from municipal stations in 1907 with the number received in 1902 shows an increase of 53.6 per cent as compared with 23.4 per cent for the commercial companies. The municipal stations are practically exempt from the consolidations that so frequently occur among commercial companies, and this fact no doubt accounts in large part for the proportionately greater increase in the former class of stations. Not only was there a large increase in the number of municipal stations, but an analysis of the reports shows that although 33 municipal stations which reported in 1902 had become commercial stations in 1907, 113 stations which were reported as commercial in 1902 had become municipal in 1907. The claim has been made, and sustained by what appears to be reasonable argument, that the drift of these public utilities is from municipal to commercial, but the results of the census do not furnish corroborative evidence of this. On the contrary there appears to be a distinct field for municipal electric stations, not only because of a feeling which may exist in many localities that these public utilities should be owned by the cities, but because many of the places in which municipal plants are located do not present sufficient inducement for the investment of commercial capital.

TABLE 15.—*Municipal central electric stations—Number, with additions since 1902, by geographic divisions: 1907.*

| DIVISION.           | Total reported in 1907. | Reported in 1902 and 1907. | Constructed since 1902. | Commercial in 1902 and municipal in 1907. | In operation in 1902 but not reported at that census. |
|---------------------|-------------------------|----------------------------|-------------------------|-------------------------------------------|-------------------------------------------------------|
| Total.....          | 1,252                   | 774                        | 348                     | 113                                       | 17                                                    |
| North Atlantic..... | 150                     | 100                        | 39                      | 9                                         | 2                                                     |
| South Atlantic..... | 158                     | 72                         | 66                      | 17                                        | 3                                                     |
| North Central.....  | 727                     | 502                        | 180                     | 57                                        | 8                                                     |
| South Central.....  | 166                     | 77                         | 63                      | 24                                        | 2                                                     |
| Western.....        | 51                      | 23                         | 20                      | 6                                         | 2                                                     |

The stability of these plants is exemplified by the fact that 774 of the 815 municipal plants reported in 1902 also reported in 1907. Of the 41 which failed to report in 1907, 33 had become commercial stations, as previously noted; 4 had discontinued operations or were idle; 2 were connected with public institutions, the plants of which were excluded from the census of 1907; 1 was merged with another municipal plant because of the consolidation of two cities since 1902; and 1 was destroyed by fire and had not been rebuilt at the time of taking the census of 1907.

Reasons have already been given for the omission of the statistics of central stations, classified by the population of the places in which the plants were located. The objections, which are pronounced for the commercial stations, are not, however, deemed sufficient to warrant the omission of general statistics for the municipal stations showing distribution by population grouping. The number of these stations in each geographic division by population groupings is presented in Table 16.

TABLE 16.—*Municipal central electric stations—Number, by population of cities in which located and by geographic divisions: 1907 and 1902.*

[The cities have been grouped according to their population in 1900.]

| DIVISION.           | Census.      | Total.       | NUMBER OF STATIONS IN CITIES HAVING A POPULATION OF— |                         |                           |                            |                   |
|---------------------|--------------|--------------|------------------------------------------------------|-------------------------|---------------------------|----------------------------|-------------------|
|                     |              |              | Under 5,000.                                         | 5,000 but under 25,000. | 25,000 but under 100,000. | 100,000 but under 500,000. | 500,000 and over. |
| Total.....          | 1907<br>1902 | 1,252<br>815 | 1,081<br>671                                         | 142<br>121              | 17<br>13                  | 6<br>6                     | 6<br>4            |
| North Atlantic..... | 1907<br>1902 | 150<br>103   | 107<br>68                                            | 38<br>31                | 3<br>2                    | 1<br>2                     | 1                 |
| South Atlantic..... | 1907<br>1902 | 158<br>75    | 142<br>62                                            | 13<br>11                | 2<br>2                    | .....                      | 1                 |
| North Central.....  | 1907<br>1902 | 727<br>528   | 636<br>449                                           | 76<br>67                | 6<br>4                    | 5<br>4                     | 4<br>4            |
| South Central.....  | 1907<br>1902 | 166<br>81    | 152<br>68                                            | 10<br>9                 | 4<br>4                    | .....                      | .....             |
| Western.....        | 1907<br>1902 | 51<br>28     | 44<br>24                                             | 5<br>3                  | 2<br>1                    | .....                      | .....             |

Table 16 shows that most of the municipal stations are in places of small population, nearly seven-eighths of the total number being located in places of less than 5,000 population and less than 3 per cent in places having a population of 25,000 and over. In the 3 divisions—the South Atlantic, the South Central, and the Western—together, only 1 station was reported in 1907 for cities of over 100,000 population, but it is to be remembered that in these 3 divisions together there were only 8 cities of this class according to the census of 1900. In the North Atlantic division there were 16 cities of this class, with only 2 municipal plants in 1907; and in the North Central, 14 cities, with 9 municipal plants. The 1 station reported for the South Atlantic division was in Baltimore, while the 4 stations in the “500,000 and over” class in 1907 and 1902 in the North Central division were all located in Chicago.

Table 17 gives detailed statistics of municipal stations, classified according to population of places in which located.

Although, as already noticed, the group of smallest population embraced seven-eighths of the total number of municipal stations, their proportion of other leading items in the table was smaller, varying from about one-half to two-thirds, except for the number of arc lamps, for which the proportion was only about three-eighths. Nearly one-eighth of the total number of stations were found in the next higher group, “5,000 but under 25,000,” and these stations reported about one-fourth of the totals for the several chief items. For the remaining three groups, the various items of finance, equipment, and output were naturally much out of proportion to the number of stations. For the group “25,000 but under 100,000,” the leading items averaged roughly 9 per cent of their several totals, and for each of the two groups embracing the cities of largest population, 5 or 6 per cent. In the stations of the cities of largest population the high proportion of arc lamps as compared with incandescent lamps is noteworthy, and clearly indicates the character of the service of the few stations in the large cities.

The North Central division reported considerably more than one-half of the total number of municipal stations and the same proportion of all the other chief items in Table 17. The North Atlantic division stood second. The figures for the stations in the South Central and South Atlantic divisions are about equal as a whole, and those for the Western division the smallest in every respect, except for incandescent and for “Other varieties” of lamps.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 17.—MUNICIPAL CENTRAL ELECTRIC STATIONS, BY POPULATION OF CITIES

[The cities have been grouped]

| DIVISION AND POPULATION GROUP. |                                             | Census. | Number of stations. | Cost of construction and equipment. | INCOME.      |                   |                    |
|--------------------------------|---------------------------------------------|---------|---------------------|-------------------------------------|--------------|-------------------|--------------------|
|                                |                                             |         |                     |                                     | Total.       | Electric service. | All other sources. |
| 1                              | Total .....                                 | 1907    | 1,252               | \$42,879,447                        | \$14,011,999 | \$13,614,434      | \$397,565          |
| 2                              |                                             | 1902    | 815                 | 22,020,473                          | 6,965,105    | 6,836,866         | 128,249            |
| 3                              | Under 5,000 .....                           | 1907    | 1,081               | 21,476,667                          | 7,631,842    | 7,337,260         | 294,582            |
| 4                              |                                             | 1902    | 671                 | 11,074,008                          | 3,621,023    | 3,538,468         | 82,555             |
| 5                              | 5,000 but under 25,000 .....                | 1907    | 142                 | 9,726,310                           | 3,466,142    | 3,389,192         | 76,950             |
| 6                              |                                             | 1902    | 121                 | 5,605,178                           | 1,766,000    | 1,732,887         | 32,103             |
| 7                              | 25,000 but under 100,000 .....              | 1907    | 17                  | 4,823,033                           | 1,414,810    | 1,408,521         | 6,289              |
| 8                              |                                             | 1902    | 13                  | 1,553,931                           | 455,204      | 455,149           | 55                 |
| 9                              | 100,000 but under 500,000 .....             | 1907    | 6                   | 2,760,732                           | 736,276      | 716,532           | 19,744             |
| 10                             |                                             | 1902    | 6                   | 1,607,803                           | 441,235      | 427,699           | 13,536             |
| 11                             | 500,000 and over .....                      | 1907    | 6                   | 4,092,705                           | 762,929      | 762,929           | .....              |
| 12                             |                                             | 1902    | 4                   | 2,179,553                           | 682,643      | 682,643           | .....              |
| 13                             | North Atlantic .....                        | 1907    | 150                 | 7,838,995                           | 2,308,082    | 2,266,506         | 41,576             |
| 14                             |                                             | 1902    | 103                 | 3,942,139                           | 1,089,531    | 1,075,283         | 14,248             |
| 15                             | Under 5,000 .....                           | 1907    | 107                 | 3,088,388                           | 872,150      | 845,774           | 26,376             |
| 16                             |                                             | 1902    | 68                  | 1,697,447                           | 392,586      | 384,109           | 8,477              |
| 17                             | 5,000 but under 25,000 .....                | 1907    | 38                  | 3,025,195                           | 897,546      | 882,346           | 15,200             |
| 18                             |                                             | 1902    | 31                  | 1,510,923                           | 424,886      | 419,115           | 5,771              |
| 19                             | 25,000 but under 100,000 <sup>2</sup> ..... | 1907    | 5                   | 1,725,412                           | 538,386      | 538,386           | .....              |
| 20                             |                                             | 1902    | 4                   | 733,769                             | 272,069      | 272,069           | .....              |
| 21                             | South Atlantic .....                        | 1907    | 158                 | 4,076,042                           | 1,621,309    | 1,574,043         | 47,266             |
| 22                             |                                             | 1902    | 75                  | 1,561,938                           | 583,162      | 577,479           | 5,683              |
| 23                             | Under 5,000 .....                           | 1907    | 142                 | 2,973,002                           | 1,072,023    | 1,027,220         | 44,803             |
| 24                             |                                             | 1902    | 62                  | 920,726                             | 333,335      | 328,776           | 4,559              |
| 25                             | 5,000 but under 25,000 <sup>3</sup> .....   | 1907    | 13                  | 476,510                             | 230,343      | 227,890           | 2,463              |
| 26                             |                                             | 1902    | 13                  | 641,212                             | 249,827      | 248,703           | 1,124              |
| 27                             | 25,000 but under 100,000 <sup>4</sup> ..... | 1907    | 3                   | 626,530                             | 318,943      | 318,943           | .....              |
| 28                             | North Central .....                         | 1907    | 727                 | 22,955,162                          | 7,403,015    | 7,142,782         | 260,233            |
| 29                             |                                             | 1902    | 528                 | 13,872,245                          | 4,397,509    | 4,308,879         | 88,630             |
| 30                             | Under 5,000 .....                           | 1907    | 636                 | 11,306,559                          | 4,178,706    | 3,992,505         | 186,201            |
| 31                             |                                             | 1902    | 449                 | 7,151,667                           | 2,396,828    | 2,338,038         | 58,790             |
| 32                             | 5,000 but under 25,000 .....                | 1907    | 76                  | 4,828,705                           | 1,829,198    | 1,775,195         | 54,003             |
| 33                             |                                             | 1902    | 67                  | 3,145,901                           | 1,009,166    | 992,917           | 16,249             |
| 34                             | 25,000 but under 100,000 .....              | 1907    | 6                   | 665,888                             | 200,438      | 200,123           | 315                |
| 35                             |                                             | 1902    | 4                   | 302,811                             | 87,817       | 87,762            | 55                 |
| 36                             | 100,000 but under 500,000 .....             | 1907    | 5                   | 2,177,490                           | 472,801      | 453,057           | 19,744             |
| 37                             |                                             | 1902    | 4                   | 1,092,313                           | 221,055      | 207,519           | 13,536             |
| 38                             | 500,000 and over .....                      | 1907    | 4                   | 3,976,520                           | 721,872      | 721,872           | .....              |
| 39                             |                                             | 1902    | 4                   | 2,179,553                           | 682,643      | 682,643           | .....              |
| 40                             | South Central .....                         | 1907    | 166                 | 4,259,121                           | 1,640,608    | 1,609,032         | 31,576             |
| 41                             |                                             | 1902    | 81                  | 1,582,386                           | 566,146      | 554,208           | 11,938             |
| 42                             | Under 5,000 .....                           | 1907    | 152                 | 3,046,244                           | 1,133,925    | 1,104,549         | 29,376             |
| 43                             |                                             | 1902    | 68                  | 929,481                             | 364,251      | 354,350           | 9,901              |
| 44                             | 5,000 but under 25,000 .....                | 1907    | 10                  | 705,562                             | 321,549      | 319,349           | 2,200              |
| 45                             |                                             | 1902    | 9                   | 364,730                             | 142,742      | 140,705           | 2,037              |
| 46                             | 25,000 but under 100,000 .....              | 1907    | 4                   | 507,325                             | 185,134      | 185,134           | .....              |
| 47                             |                                             | 1902    | 4                   | 288,175                             | 59,153       | 59,153            | .....              |
| 48                             | Western .....                               | 1907    | 51                  | 3,750,127                           | 1,038,985    | 1,022,101         | 16,884             |
| 49                             |                                             | 1902    | 28                  | 1,061,765                           | 328,757      | 321,007           | 7,750              |
| 50                             | Under 5,000 .....                           | 1907    | 44                  | 1,062,474                           | 375,038      | 367,212           | 7,826              |
| 51                             |                                             | 1902    | 24                  | 374,687                             | 134,023      | 133,195           | 828                |
| 52                             | 5,000 but under 25,000 <sup>5</sup> .....   | 1907    | 7                   | 2,687,653                           | 663,947      | 654,880           | 9,058              |
| 53                             |                                             | 1902    | 4                   | 687,078                             | 194,734      | 187,812           | 6,922              |

<sup>1</sup> Not reported separately in 1902.<sup>2</sup> Includes 1 station of the "100,000 but under 500,000" group and 1 station of the "500,000 and over" group in 1907, and 2 stations of the former group in 1902, in order that the operations of individual stations may not be disclosed.



## SUMMARY OF STATISTICS.

31

IN WHICH LOCATED AND BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

according to their population in 1900.]

| Total <sup>1</sup><br>expenses. | Primary-power<br>plant, total<br>horsepower. | KILOWATT CAPACITY OF DYNAMOS. |                      |                       |                                                          | Output of sta-<br>tions, kilowatt<br>hours. | LAMPS WIRED FOR SERVICE. |                        |                                                                     |          |
|---------------------------------|----------------------------------------------|-------------------------------|----------------------|-----------------------|----------------------------------------------------------|---------------------------------------------|--------------------------|------------------------|---------------------------------------------------------------------|----------|
|                                 |                                              | Total.                        | Direct current.      |                       | Alternating<br>single-phase<br>and polyphase<br>current. |                                             | Arc.                     | Incandescent.          | Other varie-<br>ties—Nernst,<br>vacuum,<br>vapor, etc. <sup>1</sup> |          |
|                                 |                                              |                               | Constant<br>voltage. | Constant<br>amperage. |                                                          |                                             |                          |                        |                                                                     |          |
| \$9,167,188<br>4,741,182        | 321,351<br>160,028                           | 209,016<br>113,380            | 26,754<br>17,556     | 19,239<br>28,171      | 163,023<br>67,653                                        | 289,462,788<br>195,904,439                  | 82,940<br>50,795         | 4,052,448<br>1,577,451 | 8,870                                                               | 1<br>2   |
| 5,298,119<br>2,620,167          | 194,172<br>93,282                            | 130,174<br>64,650             | 22,179<br>13,450     | 5,178<br>7,229        | 102,819<br>43,971                                        | 146,906,359<br>105,518,293                  | 30,888<br>19,611         | 2,719,249<br>1,094,946 | 3,270                                                               | 3<br>4   |
| 2,128,859<br>1,212,636          | 75,975<br>40,123                             | 48,107<br>28,966              | 2,813<br>2,867       | 4,895<br>7,625        | 40,399<br>18,474                                         | 78,788,119<br>56,286,059                    | 23,033<br>15,701         | 952,967<br>391,645     | 1,565                                                               | 5<br>6   |
| 778,358<br>315,139              | 25,763<br>7,713                              | 14,812<br>5,394               | 942<br>927           | 2,465<br>1,892        | 11,405<br>2,575                                          | 29,815,562<br>8,929,900                     | 9,549<br>4,800           | 325,548<br>66,840      | 3,738                                                               | 7<br>8   |
| 373,750<br>255,606              | 12,616<br>6,065                              | 8,250<br>4,263                | 350<br>107           | 1,890<br>2,762        | 6,010<br>1,394                                           | 17,819,478<br>9,543,807                     | 8,393<br>4,544           | 42,754<br>21,620       | 282                                                                 | 9<br>10  |
| 588,102<br>337,634              | 12,825<br>9,825                              | 7,673<br>10,107               | 470<br>205           | 4,813<br>8,663        | 2,390<br>1,239                                           | 16,133,270<br>15,626,380                    | 11,077<br>6,139          | 11,930<br>2,400        | 15                                                                  | 11<br>12 |
| 1,406,815<br>768,353            | 53,580<br>20,657                             | 35,325<br>17,885              | 2,133<br>1,334       | 3,370<br>4,225        | 29,822<br>12,326                                         | 48,861,638<br>28,469,646                    | 12,320<br>7,846          | 703,634<br>272,212     | 1,149                                                               | 13<br>14 |
| 567,090<br>294,739              | 24,240<br>13,967                             | 16,103<br>8,528               | 771<br>660           | 905<br>954            | 14,427<br>6,914                                          | 17,742,732<br>12,624,636                    | 3,546<br>2,387           | 397,819<br>151,985     | 446                                                                 | 15<br>16 |
| 571,386<br>318,692              | 21,049<br>9,615                              | 12,892<br>6,917               | 950<br>551           | 1,247<br>1,566        | 10,695<br>4,800                                          | 19,182,675<br>10,983,988                    | 5,345<br>3,464           | 254,749<br>104,902     | 590                                                                 | 17<br>18 |
| 268,339<br>154,922              | 11,291<br>3,075                              | 6,330<br>2,440                | 412<br>123           | 1,218<br>1,705        | 4,700<br>612                                             | 11,936,231<br>4,861,022                     | 3,429<br>1,995           | 51,066<br>15,325       | 113                                                                 | 19<br>20 |
| 1,051,602<br>385,412            | 36,542<br>12,410                             | 22,759<br>8,439               | 2,138<br>1,171       | 1,482<br>1,672        | 19,139<br>5,626                                          | 30,300,397<br>17,072,971                    | 7,529<br>4,230           | 402,953<br>107,764     | 63                                                                  | 21<br>22 |
| 726,425<br>240,438              | 25,119<br>8,070                              | 17,349<br>5,215               | 1,543<br>798         | 232<br>574            | 15,574<br>3,843                                          | 18,283,131<br>10,349,782                    | 4,650<br>2,010           | 294,643<br>68,843      | 40                                                                  | 23<br>24 |
| 137,415<br>144,974              | 4,950<br>4,340                               | 3,183<br>3,254                | .....<br>373         | 568<br>1,098          | 2,615<br>1,783                                           | 4,563,870<br>6,723,189                      | 1,715<br>2,220           | 43,880<br>38,921       | 23                                                                  | 25<br>26 |
| 187,762                         | 6,473                                        | 2,227                         | 595                  | 682                   | 950                                                      | 7,453,396                                   | 1,164                    | 64,430                 | .....                                                               | 27       |
| 5,072,384<br>2,938,835          | 178,221<br>102,895                           | 115,990<br>73,169             | 19,240<br>12,578     | 13,477<br>20,704      | 83,273<br>39,887                                         | 159,005,189<br>127,865,521                  | 52,327<br>33,595         | 2,204,135<br>1,014,120 | 3,609                                                               | 28<br>29 |
| 2,999,451<br>1,730,542          | 110,320<br>62,994                            | 73,973<br>42,472              | 16,885<br>9,740      | 3,979<br>5,294        | 53,109<br>27,438                                         | 81,262,275<br>68,683,634                    | 18,351<br>13,314         | 1,625,908<br>770,658   | 2,360                                                               | 30<br>31 |
| 1,127,782<br>658,289            | 40,166<br>24,123                             | 26,042<br>16,843              | 1,705<br>2,005       | 2,678<br>4,976        | 21,659<br>9,962                                          | 43,628,086<br>35,277,472                    | 13,544<br>9,699          | 521,401<br>220,772     | 945                                                                 | 32<br>33 |
| 136,986<br>61,575               | 3,875<br>1,778                               | 2,735<br>989                  | 300<br>583           | 1,080<br>182          | 1,355<br>224                                             | 5,521,786<br>2,545,510                      | 2,755<br>1,349           | 16,565<br>1,100        | 7                                                                   | 34<br>35 |
| 260,168<br>144,965              | 9,720<br>4,175                               | 6,037<br>2,758                | 350<br>45            | 927<br>1,588          | 4,760<br>1,125                                           | 13,487,582<br>5,732,525                     | 6,801<br>3,094           | 32,661<br>13,190       | 282                                                                 | 36<br>37 |
| 547,997<br>337,634              | 12,140<br>9,825                              | 7,203<br>10,107               | .....<br>205         | 4,813<br>8,664        | 2,390<br>1,238                                           | 15,105,460<br>15,626,380                    | 10,876<br>6,139          | 7,600<br>2,400         | 15                                                                  | 38<br>39 |
| 1,070,069<br>403,246            | 36,440<br>14,548                             | 25,133<br>10,393              | 2,997<br>1,402       | 843<br>1,362          | 21,293<br>7,629                                          | 34,365,978<br>17,484,135                    | 7,188<br>3,640           | 353,646<br>108,521     | 187                                                                 | 40<br>41 |
| 788,196<br>231,938              | 27,510<br>8,908                              | 18,415<br>5,862               | 2,734<br>1,186       | 38<br>299             | 15,643<br>4,377                                          | 23,272,368<br>10,517,220                    | 3,578<br>1,552           | 286,134<br>78,623      | 187                                                                 | 42<br>43 |
| 182,060<br>103,559              | 5,625<br>3,320                               | 3,215<br>2,783                | 158<br>82            | 357<br>612            | 3,300<br>2,089                                           | 6,861,650<br>5,233,720                      | 1,680<br>1,054           | 63,388<br>27,365       | .....                                                               | 44<br>45 |
| 99,813<br>37,749                | 3,305<br>2,320                               | 2,903<br>1,748                | 105<br>134           | 448<br>451            | 2,350<br>1,163                                           | 4,231,960<br>1,733,195                      | 1,930<br>1,034           | 4,124<br>2,533         | .....                                                               | 46<br>47 |
| 566,318<br>245,336              | 15,568<br>3,518                              | 9,809<br>3,434                | 245<br>1,071         | 67<br>208             | 9,496<br>2,185                                           | 16,929,596<br>5,012,166                     | 3,576<br>1,484           | 388,080<br>74,834      | 3,862                                                               | 48<br>49 |
| 216,957<br>83,710               | 6,983<br>2,343                               | 4,334<br>2,573                | 246<br>1,036         | 22<br>108             | 4,066<br>1,399                                           | 6,345,853<br>3,343,021                      | 763<br>348               | 114,745<br>24,837      | 237                                                                 | 50<br>51 |
| 349,331<br>158,656              | 8,585<br>1,175                               | 5,475<br>831                  | .....<br>5           | 45<br>100             | 5,430<br>786                                             | 10,583,733<br>1,609,145                     | 2,813<br>1,136           | 273,335<br>49,997      | 3,625                                                               | 52<br>53 |

<sup>1</sup> Includes 2 stations of the "25,000 but under 100,000" group in 1902.<sup>2</sup> Includes 1 station of the "500,000 and over" group in 1907.<sup>3</sup> Includes 2 stations of the "25,000 but under 100,000" group in 1907, and 1 station of this group in 1902.

Nearly nine-tenths of the municipal stations are located in places for which they supply the entire electric current used, and the statistics for these

stations, by geographic divisions, are presented in Table 18.

TABLE 18.—MUNICIPAL CENTRAL ELECTRIC STATIONS WHICH SUPPLY THE ENTIRE ELECTRIC SERVICE IN THE CITIES WHERE LOCATED, BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

|                                                                | Census.      | Total.                       | DIVISION.                  |                            |                             |                            |                          |
|----------------------------------------------------------------|--------------|------------------------------|----------------------------|----------------------------|-----------------------------|----------------------------|--------------------------|
|                                                                |              |                              | North Atlantic.            | South Atlantic.            | North Central.              | South Central.             | Western.                 |
| Number of stations.....                                        | 1907<br>1902 | 1,114<br>732                 | 123<br>93                  | 143<br>65                  | 658<br>476                  | 152<br>72                  | 38<br>26                 |
| Cost of construction and equipment.....                        | 1907<br>1902 | \$27,310,126<br>\$15,369,382 | \$5,259,164<br>\$3,121,983 | \$3,602,972<br>\$1,043,002 | \$14,117,689<br>\$8,963,636 | \$3,485,405<br>\$1,203,363 | \$844,906<br>\$1,037,368 |
| Gross income.....                                              | 1907<br>1902 | \$9,762,111<br>\$4,923,196   | \$1,452,700<br>\$770,903   | \$1,396,523<br>\$372,983   | \$5,273,996<br>\$2,985,836  | \$1,369,437<br>\$473,597   | \$269,453<br>\$319,877   |
| Electric service.....                                          | 1907<br>1902 | \$9,419,223<br>\$4,814,568   | \$1,416,548<br>\$756,655   | \$1,354,603<br>\$367,300   | \$5,047,744<br>\$2,916,827  | \$1,338,200<br>\$461,659   | \$262,128<br>\$312,127   |
| Lighting.....                                                  | 1907<br>1902 | \$9,026,172<br>\$4,741,735   | \$1,331,363<br>\$741,502   | \$1,305,739<br>\$366,639   | \$4,876,268<br>\$2,889,183  | \$1,274,062<br>\$450,177   | \$238,740<br>\$294,234   |
| Commercial.....                                                | 1907<br>1902 | \$6,204,396<br>\$2,925,788   | \$905,934<br>\$389,206     | \$906,681<br>\$199,029     | \$3,371,141<br>\$1,827,478  | \$929,799<br>\$304,860     | \$190,841<br>\$205,215   |
| Public.....                                                    | 1907<br>1902 | \$2,821,776<br>\$1,815,947   | \$525,429<br>\$352,296     | \$399,058<br>\$167,610     | \$1,505,127<br>\$1,061,705  | \$344,263<br>\$145,317     | \$47,899<br>\$89,019     |
| Stationary motors.....                                         | 1907<br>1902 | \$342,865<br>\$63,880        | \$79,634<br>\$12,638       | \$45,128<br>\$661          | \$151,706<br>\$24,098       | \$45,481<br>\$11,082       | \$20,916<br>\$15,401     |
| All other.....                                                 | 1907<br>1902 | \$50,186<br>\$8,953          | \$5,551<br>\$2,515         | \$3,736<br>\$3,546         | \$19,770<br>\$3,546         | \$18,657<br>\$400          | \$2,472<br>\$2,492       |
| All other sources.....                                         | 1907<br>1902 | \$342,888<br>\$108,628       | \$36,152<br>\$14,248       | \$41,920<br>\$5,683        | \$226,254<br>\$69,009       | \$31,237<br>\$11,938       | \$7,325<br>\$7,750       |
| Total expenses.....                                            | 1907<br>1902 | \$6,573,242<br>\$3,567,352   | \$930,274<br>\$595,586     | \$890,831<br>\$267,091     | \$3,674,883<br>\$2,120,088  | \$909,922<br>\$342,275     | \$167,332<br>\$242,312   |
| Cost of supplies and materials <sup>1</sup> .....              | 1907<br>1902 | \$3,649,243<br>\$1,884,539   | \$479,940<br>\$281,178     | \$509,973<br>\$150,187     | \$2,062,699<br>\$1,136,979  | \$510,027<br>\$186,321     | \$86,604<br>\$129,874    |
| Miscellaneous expenses.....                                    | 1907<br>1902 | \$558,630<br>\$327,980       | \$105,895<br>\$79,340      | \$50,764<br>\$16,559       | \$309,320<br>\$179,925      | \$78,296<br>\$25,053       | \$14,355<br>\$27,103     |
| Salaries and wages.....                                        | 1907<br>1902 | \$2,365,399<br>\$1,354,833   | \$344,439<br>\$235,068     | \$330,094<br>\$100,345     | \$1,302,864<br>\$903,184    | \$321,599<br>\$130,901     | \$66,373<br>\$85,335     |
| Primary-power plant:                                           |              |                              |                            |                            |                             |                            |                          |
| Total horsepower capacity <sup>2</sup> .....                   | 1907<br>1902 | 241,028<br>124,362           | 37,914<br>22,317           | 32,037<br>8,825            | 134,554<br>78,124           | 31,270<br>11,653           | 5,253<br>3,443           |
| Generating plant:                                              |              |                              |                            |                            |                             |                            |                          |
| Kilowatt capacity of dynamos.....                              | 1907<br>1902 | 159,265<br>85,122            | 25,087<br>15,155           | 20,157<br>5,747            | 89,558<br>52,526            | 21,069<br>8,264            | 3,394<br>3,430           |
| Output of stations, kilowatt hours.....                        | 1907<br>1902 | 196,435,621<br>148,913,431   | 27,540,654<br>21,820,641   | 25,000,947<br>11,717,107   | 110,478,858<br>95,812,332   | 28,335,699<br>14,611,775   | 4,479,463<br>4,951,576   |
| Lamps wired for service:                                       |              |                              |                            |                            |                             |                            |                          |
| Arc.....                                                       | 1907<br>1902 | 40,965<br>28,631             | 6,001<br>5,126             | 5,588<br>2,334             | 24,370<br>17,570            | 4,568<br>2,201             | 438<br>1,400             |
| Incandescent <sup>3</sup> .....                                | 1907<br>1902 | 3,363,195<br>1,465,582       | 580,424<br>259,577         | 369,264<br>78,779          | 1,987,470<br>947,946        | 236,496<br>104,446         | 89,541<br>74,834         |
| Other varieties—Nernst, vacuum, vapor, etc. <sup>4</sup> ..... | 1907         | 3,753                        | 770                        | 42                         | 2,570                       | 167                        | 204                      |

<sup>1</sup> Includes cost of fuel amounting to \$2,517,986 in 1907 and \$1,124,403 in 1902.

<sup>2</sup> Includes capacity of auxiliary engines amounting to 1,134 horsepower in 1907 and 525 horsepower in 1902.

<sup>3</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.

<sup>4</sup> Not reported separately in 1902.

Large increases are shown for all but the Western division. In this division decreases are found for nearly every item, but these decreases are only apparent and not real. A number of municipal stations which were included in this class in 1902 could not properly be included in 1907 because in the latter year they did not supply the sole electric service to the places in which they were located. This was particularly the case in the states of California and Washington. If all the stations in these 2 states which were included in 1902 had also been included in 1907, uniform gains would have been shown for the Western division also.

It is noteworthy that proportionately larger gains

were reported for commercial lighting than for public lighting, and for incandescent lamps than for arc lamps. This was true for all geographic divisions. Compared with the increases for most of the items the output of stations in kilowatt hours shows small percentages of gain. This is in large part due to the difference in the stations included at the respective censuses, previously referred to, and to the fact that a somewhat larger amount was expended in 1907 than in 1902 for power purchased, the difference amounting to upward of \$70,000.

The statistics for municipal stations located in places where they furnished only a part of the electric service are shown, by geographic divisions, in Table 19.

TABLE 19.—MUNICIPAL CENTRAL ELECTRIC STATIONS WHICH DO NOT SUPPLY THE ENTIRE ELECTRIC SERVICE IN THE CITIES WHERE LOCATED, BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

|                                                                      | Census.      | Total.                      | DIVISION.                |                        |                            |                        |                         |
|----------------------------------------------------------------------|--------------|-----------------------------|--------------------------|------------------------|----------------------------|------------------------|-------------------------|
|                                                                      |              |                             | North Atlantic.          | South Atlantic.        | North Central.             | South Central.         | Western.                |
| Number of stations.....                                              | 1907<br>1902 | 138<br>83                   | 27<br>10                 | 15<br>10               | 69<br>52                   | 14<br>9                | 13<br>2                 |
| Cost of construction and equipment.....                              | 1907<br>1902 | \$15,569,321<br>\$6,651,091 | \$2,579,831<br>\$820,156 | \$473,070<br>\$518,936 | \$8,837,473<br>\$4,908,609 | \$773,626<br>\$378,993 | \$2,908,321<br>\$24,397 |
| Gross income.....                                                    | 1907<br>1902 | \$4,249,888<br>\$2,041,909  | \$855,382<br>\$318,628   | \$224,786<br>\$210,179 | \$2,129,017<br>\$1,411,673 | \$271,171<br>\$92,549  | \$769,532<br>\$8,890    |
| Electric service.....                                                | 1907<br>1902 | \$4,195,211<br>\$2,022,288  | \$849,858<br>\$318,628   | \$219,440<br>\$210,179 | \$2,095,008<br>\$1,392,052 | \$270,832<br>\$92,549  | \$759,973<br>\$8,890    |
| Lighting.....                                                        | 1907<br>1902 | \$4,014,091<br>\$2,007,128  | \$777,665<br>\$309,618   | \$214,132<br>\$204,733 | \$2,071,438<br>\$1,391,348 | \$255,757<br>\$92,549  | \$995,099<br>\$8,890    |
| Commercial.....                                                      | 1907<br>1902 | \$1,190,591<br>\$182,674    | \$230,530<br>\$12,250    | \$78,815<br>\$88,901   | \$323,702<br>\$76,130      | \$38,758<br>\$5,393    | \$518,786<br>.....      |
| Public.....                                                          | 1907<br>1902 | \$2,823,500<br>\$1,824,454  | \$547,135<br>\$297,368   | \$135,317<br>\$115,832 | \$1,747,736<br>\$1,315,218 | \$216,999<br>\$87,156  | \$176,313<br>\$8,890    |
| Stationary motors.....                                               | 1907<br>1902 | \$173,808<br>\$6,660        | \$70,152<br>\$510        | \$5,284<br>\$5,446     | \$20,022<br>\$704          | \$15,075               | \$62,975                |
| All other.....                                                       | 1907<br>1902 | \$7,612<br>\$8,500          | \$2,141<br>\$8,500       | \$24                   | \$3,548                    | .....                  | \$1,899                 |
| All other sources.....                                               | 1907<br>1902 | \$54,677<br>\$19,621        | \$5,424                  | \$5,346                | \$34,009<br>\$19,621       | \$339                  | \$9,559                 |
| Total expenses.....                                                  | 1907<br>1902 | \$2,563,946<br>\$1,173,830  | \$476,541<br>\$172,767   | \$160,771<br>\$118,321 | \$1,397,801<br>\$818,717   | \$160,147<br>\$60,971  | \$398,968<br>\$3,054    |
| Cost of supplies and materials <sup>1</sup> .....                    | 1907<br>1902 | \$1,318,444<br>\$537,752    | \$225,857<br>\$72,814    | \$95,899<br>\$59,811   | \$725,162<br>\$374,097     | \$78,919<br>\$29,969   | \$192,607<br>\$1,061    |
| Miscellaneous expenses.....                                          | 1907<br>1902 | \$155,856<br>\$111,189      | \$42,217<br>\$23,356     | \$7,265<br>\$9,366     | \$70,935<br>\$73,902       | \$16,526<br>\$4,412    | \$18,913<br>\$153       |
| Salaries and wages.....                                              | 1907<br>1902 | \$1,119,646<br>\$524,889    | \$208,467<br>\$76,597    | \$57,607<br>\$49,144   | \$601,404<br>\$370,718     | \$64,702<br>\$26,590   | \$187,466<br>\$1,840    |
| Primary-power plant:<br>Total horsepower capacity <sup>2</sup> ..... | 1907<br>1902 | 80,323<br>35,666            | 18,666<br>4,340          | 4,505<br>3,585         | 41,667<br>24,771           | 5,170<br>2,895         | 10,315<br>75            |
| Generating plant:<br>Kilowatt capacity of dynamos.....               | 1907<br>1902 | 49,751<br>28,258            | 10,238<br>2,730          | 2,602<br>2,722         | 26,432<br>20,643           | 4,064<br>2,129         | 6,415<br>34             |
| Output of stations, kilowatt hours.....                              | 1907<br>1902 | 93,027,167<br>46,991,008    | 21,320,984<br>6,649,005  | 4,699,450<br>5,355,864 | 48,526,331<br>32,053,189   | 6,030,279<br>2,872,360 | 12,450,123<br>60,590    |
| Lamps wired for service:                                             |              |                             |                          |                        |                            |                        |                         |
| Arc.....                                                             | 1907<br>1902 | 41,975<br>22,164            | 6,319<br>2,720           | 1,941<br>1,896         | 27,957<br>16,025           | 2,620<br>1,439         | 3,138<br>84             |
| Incandescent <sup>3</sup> .....                                      | 1907<br>1902 | 699,253<br>111,899          | 123,210<br>12,635        | 33,689<br>28,985       | 216,665<br>66,174          | 17,150<br>4,075        | 268,539<br>.....        |
| Other varieties—Nernst, vacuum, vapor, etc. <sup>4</sup> .....       | 1907         | 5,117                       | 379                      | 21                     | 1,039                      | 20                     | 3,668                   |

<sup>1</sup> Includes cost of fuel amounting to \$714,797 in 1907 and \$321,421 in 1902.<sup>2</sup> Includes capacity of auxiliary engines amounting to 370 horsepower in 1907 and 310 horsepower in 1902.<sup>3</sup> The number of incandescent lamps was largely an estimate and, although mostly reported on a 16-candlepower basis, embraces a considerable number ranging from 2 to 50 candlepower.<sup>4</sup> Not reported separately in 1902.

The number of stations shown in Table 19 is only about 10 per cent of the total for municipal stations for both 1907 and 1902, but the proportions of the totals for several other leading items were much greater. For 1907 these were as follows: Gross income, 30.3 per cent; sale of current, 30.8 per cent; expenses, 28.3 per cent; primary horsepower, 25 per cent; kilowatt capacity of dynamos, 23.8 per cent; output of stations, kilowatt hours, 32.1 per cent; number of arc lamps, 50.6 per cent; and number of incandescent lamps, 17 per cent. The corresponding proportions for 1902 were: Gross income, 29.3 per cent; sale of current, 29.6 per cent; expenses, 24.8 per cent; primary horsepower, 22.3 per cent; kilowatt capacity of dynamos, 24.9 per cent; output of stations, kilowatt hours, 24 per cent; number of arc lamps, 43.6 per cent; and number of incandescent lamps, 7.1 per cent. A comparison of

Tables 18 and 19 shows that public lighting occupied a far larger proportionate place in the business of the municipal stations included in the latter table than in that of those included in Table 18. In Table 19 the income from public lighting in 1907 constituted 66.4 per cent of the total income and in Table 18 only 28.9 per cent. This difference between the two classes of municipal stations is also reflected in their varying proportions of arc lamps, which find their chief use in public lighting of streets and parks. In Table 19 the arc lamps constituted 5.7 per cent of all lamps and in Table 18 only 1.2 per cent. As the primary object of municipal stations in places where they do not supply the sole electric service is probably in most cases the lighting of streets and parks, incandescent lighting for municipal stations would chiefly be confined to places where there were no commercial stations.

In the following tabular statement the relative importance of the two classes of municipal stations in the various geographic divisions is shown on the basis of income reported:

*Municipal central electric stations that render the entire electric service and those that do not—Per cent distribution of income, by geographic divisions: 1907.*

| DIVISION.           | Municipal stations which render the entire service. | Municipal stations which render only part of the service. |
|---------------------|-----------------------------------------------------|-----------------------------------------------------------|
| Total.....          | 100.0                                               | 100.0                                                     |
| North Atlantic..... | 14.9                                                | 20.1                                                      |
| South Atlantic..... | 14.3                                                | 5.3                                                       |
| North Central.....  | 54.0                                                | 50.1                                                      |
| South Central.....  | 14.0                                                | 6.4                                                       |
| Western.....        | 2.8                                                 | 18.1                                                      |

As indicated by the income, the North Central division reported slightly more than half of the municipal central-station industry for both classes of stations. The municipal stations which render the entire electrical service were, however, proportionately stronger here. In the other geographic divisions wide differences appear in the relative importance of the two classes of municipal stations. In the South Atlantic and the South Central, as in the North Central, the municipal stations which render the entire service were proportionately stronger—considerably more than twice as strong. In the North Atlantic and the Western divisions, on the other hand, the municipal stations which render only part of the service were proportionately stronger, and in the case of the Western division more than six times as strong.

## CHAPTER III.

### POWER EQUIPMENT.

*Primary-power equipment of central stations and electric railways.*—The equipment of the primary-power plants as reported to the Bureau of the Census consists of the number and horsepower of the steam engines, steam turbines, gas engines, water wheels, and auxiliary engines. With the exception of the auxiliary engines, which represent the power used within the station to operate pumps, etc., these machines are necessarily closely allied to the equipment of the gen-

erating plant. In a few instances the primary-power plant and the electric generators are conducted under independent ownership, but the two classes of equipment are so generally interdependent that the statistics for them are associated in various tables throughout the report. The totals for the primary machines in central stations and electric-railway plants are given in Table 20.

TABLE 20.—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—NUMBER AND HORSEPOWER OF THE PRIMARY-POWER MACHINES, BY KIND OF POWER: 1907 AND 1902.

| KIND OF POWER.     | TOTAL.    |                  | CENTRAL STATIONS. |                  | ELECTRIC RAILWAYS. |                  | PER CENT OF INCREASE. |                   |                    |
|--------------------|-----------|------------------|-------------------|------------------|--------------------|------------------|-----------------------|-------------------|--------------------|
|                    | 1907      | 1902             | 1907              | 1902             | 1907               | 1902             | Total.                | Central stations. | Electric railways. |
| Total:             |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 14,635    | 10,661           | 10,998            | 7,850            | 3,637              | 2,811            | 37.3                  | 40.1              | 29.4               |
| Horsepower.....    | 6,618,011 | 3,204,333        | 4,098,188         | 1,845,048        | 2,519,823          | 1,359,285        | 106.5                 | 122.1             | 85.4               |
| Steam engines:     |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 9,088     | 8,266            | 6,820             | 5,930            | 2,259              | 2,336            | 9.9                   | 15.2              | 13.3               |
| Horsepower.....    | 3,642,819 | 2,678,074        | 1,810,040         | 1,379,941        | 1,832,779          | 1,296,133        | 36.0                  | 31.2              | 41.2               |
| Steam turbines:    |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 629       | ( <sup>2</sup> ) | 377               | ( <sup>2</sup> ) | 252                | ( <sup>2</sup> ) |                       |                   |                    |
| Horsepower.....    | 1,352,814 | ( <sup>2</sup> ) | 817,410           | ( <sup>2</sup> ) | 535,404            | ( <sup>2</sup> ) |                       |                   |                    |
| Gas engines:       |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 504       | 180              | 463               | 165              | 41                 | 15               | 180.0                 | 180.6             | 173.3              |
| Horsepower.....    | 72,163    | 14,106           | 55,828            | 12,181           | 16,335             | 1,925            | 411.6                 | 368.3             | 748.3              |
| Water wheels:      |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 2,709     | 1,549            | 2,481             | 1,390            | 228                | 159              | 74.9                  | 78.5              | 43.4               |
| Horsepower.....    | 1,441,048 | 487,625          | 1,349,087         | 438,472          | 91,961             | 49,153           | 195.5                 | 207.7             | 87.1               |
| Auxiliary engines: |           |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....        | 1,705     | 666              | 848               | 365              | 857                | 301              | 156.0                 | 132.3             | 185.4              |
| Horsepower.....    | 109,167   | 24,528           | 65,823            | 14,454           | 43,344             | 10,074           | 345.1                 | 355.4             | 330.3              |

<sup>1</sup> Decrease.

<sup>2</sup> In 1902 steam turbines were included with steam engines.

The combined horsepower of the engines and water wheels used to operate the electric machines in the central stations and railway plants more than doubled during the five years ending with 1907. The power plants of the central stations show the greater gain, representing 57.6 per cent of the total horsepower in 1902 and 61.9 per cent in 1907.

While steam is the most important primary power in both branches of the industry, its lead is greatest in the railway plants, where at both censuses it formed about 95 per cent of all the primary power reported. It was in this kind of primary power that the electric railways showed their largest proportion of the total, namely, 47.4 and 48.5 per cent, respectively, in 1907 and 1902. In respect to steam engines alone the electric railways showed a marked relative gain over 1902, but having 81,808 less horsepower than the central stations in that year as compared with an excess of 22,739 horsepower in 1907. The true measure of the comparative importance of steam power in the two branches of the electrical industry, however, is furnished by a comparison of the totals for both steam

engines and steam turbines, and this shows that, as compared with electric railways, the central stations reported an excess of 259,267 steam horsepower in 1907 and 81,808 in 1902.

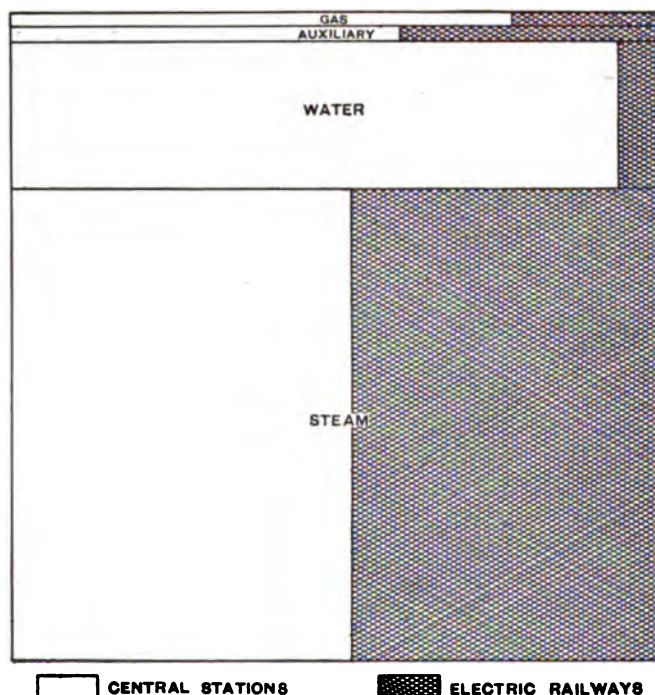
The horsepower of gas engines, although forming but a small proportion of the total primary power, showed a decided increase in both branches of the electrical industry, but the proportion was greatest for the electric railways, this particular kind of power having increased from 13.6 per cent in 1902 to 22.6 per cent in 1907. Water power has developed more rapidly as connected with the central stations than with the electric railways, the proportion of the total reported by the former having increased from 89.9 per cent in 1902 to 93.6 per cent in 1907.

#### CENTRAL STATIONS.

*Engines and water wheels.*—Table 21 gives statistics of the primary-power equipment of commercial and municipal central stations for 1907 and 1902 and shows the percentages of increase.

**TABLE 21.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER AND HORSEPOWER OF THE PRIMARY-POWER MACHINES, BY KIND OF POWER: 1907 AND 1902.**

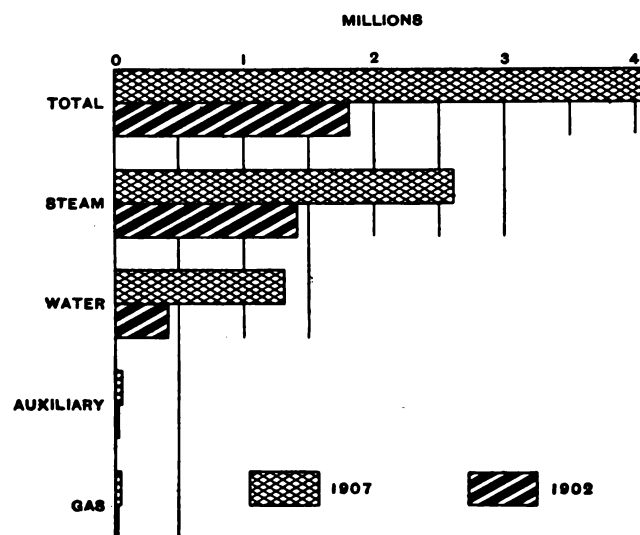
| KIND OF POWER.     | TOTAL.    |                  | COMMERCIAL. |                  | MUNICIPAL. |                  | PER CENT OF INCREASE. |                  |            |
|--------------------|-----------|------------------|-------------|------------------|------------|------------------|-----------------------|------------------|------------|
|                    | 1907      | 1902             | 1907        | 1902             | 1907       | 1902             | Total.                | Commer-<br>cial. | Municipal. |
| Total:             |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 10,998    | 7,850            | 8,981       | 6,654            | 2,017      | 1,196            | 40.1                  | 35.0             | 68.6       |
| Horsepower.....    | 4,098,188 | 1,845,048        | 3,776,837   | 1,685,020        | 321,351    | 160,028          | 122.1                 | 124.1            | 100.8      |
| Steam engines:     |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 6,829     | 5,930            | 5,144       | 4,870            | 1,685      | 1,060            | 15.2                  | 5.6              | 59.0       |
| Horsepower.....    | 1,810,040 | 1,379,941        | 1,546,007   | 1,232,923        | 264,033    | 147,018          | 31.2                  | 25.4             | 79.6       |
| Steam turbines:    |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 377       | ( <sup>1</sup> ) | 348         | ( <sup>1</sup> ) | 29         | ( <sup>1</sup> ) |                       |                  |            |
| Horsepower.....    | 817,410   | ( <sup>1</sup> ) | 798,025     | ( <sup>1</sup> ) | 19,385     | ( <sup>1</sup> ) |                       |                  |            |
| Gas engines:       |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 463       | 165              | 385         | 147              | 78         | 18               | 180.6                 | 161.9            | 333.3      |
| Horsepower.....    | 55,828    | 12,181           | 49,746      | 11,224           | 6,082      | 957              | 358.3                 | 343.2            | 535.5      |
| Water wheels:      |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 2,481     | 1,390            | 2,328       | 1,308            | 153        | 82               | 78.5                  | 78.0             | 86.6       |
| Horsepower.....    | 1,349,087 | 438,472          | 1,318,740   | 427,254          | 30,347     | 11,218           | 207.7                 | 208.7            | 170.5      |
| Auxiliary engines: |           |                  |             |                  |            |                  |                       |                  |            |
| Number.....        | 848       | 365              | 776         | 329              | 72         | 36               | 132.3                 | 135.9            | 100.0      |
| Horsepower.....    | 65,823    | 14,454           | 64,319      | 13,619           | 1,504      | 835              | 355.4                 | 372.3            | 83.7       |

<sup>1</sup> In 1902 steam turbines were included with steam engines.**DIAGRAM 1.—Central stations and electric railways, by character of primary power: 1907.**

In 1907 the primary machines of the central stations averaged 869 horsepower per station as compared with 510 horsepower in 1902, an increase of 359 horsepower, or 70.4 per cent. The commercial stations averaged 1,091 horsepower in 1907 and 601 horsepower in 1902, showing an increase of 490 horsepower, or 81.5 per cent; while the municipal stations averaged 257 horsepower in 1907 and 196 horsepower in 1902, showing an increase of 61 horsepower, or 31.1 per cent.

Steam has contributed more than any other kind of power to the great increase, 1,247,509 horsepower, in the primary power of central stations, and the steam turbine, which was first reported separately in this industry at the census of 1907, has become a very im-

portant factor in the electrical generating equipment. Water is used as the primary power in a constantly increasing number of stations, and the power of the wheels increased by 910,615 horsepower during the five years ending with 1907. Although the greatest absolute increase was shown for steam power, in percentage of increase, it was surpassed by both gas and water power. The percentages are: Steam power, 90.4 per cent; water power, 207.7 per cent; and gas power, 358.3 per cent.

**DIAGRAM 2.—Central stations, by character of primary power: 1907 and 1902.**

Of the two classes of stations the commercial shows by far the greater amount of power and the larger increase since 1902. In 1907 their equipment represented 92.2 per cent of the total primary power, the proportion having increased from 91.3 per cent in 1902. Thus, while the municipal electric stations, as compared with many industries, have a large motive-power equipment, it forms but a small proportion (7.8 per cent) of the primary power used for the generation of electricity in central stations.

DIAGRAM 3.—CENTRAL ELECTRIC STATIONS—PRIMARY POWER, BY STATES, ARRANGED IN ORDER OF THEIR  
RELATIVE IMPORTANCE: 1907 AND 1902.

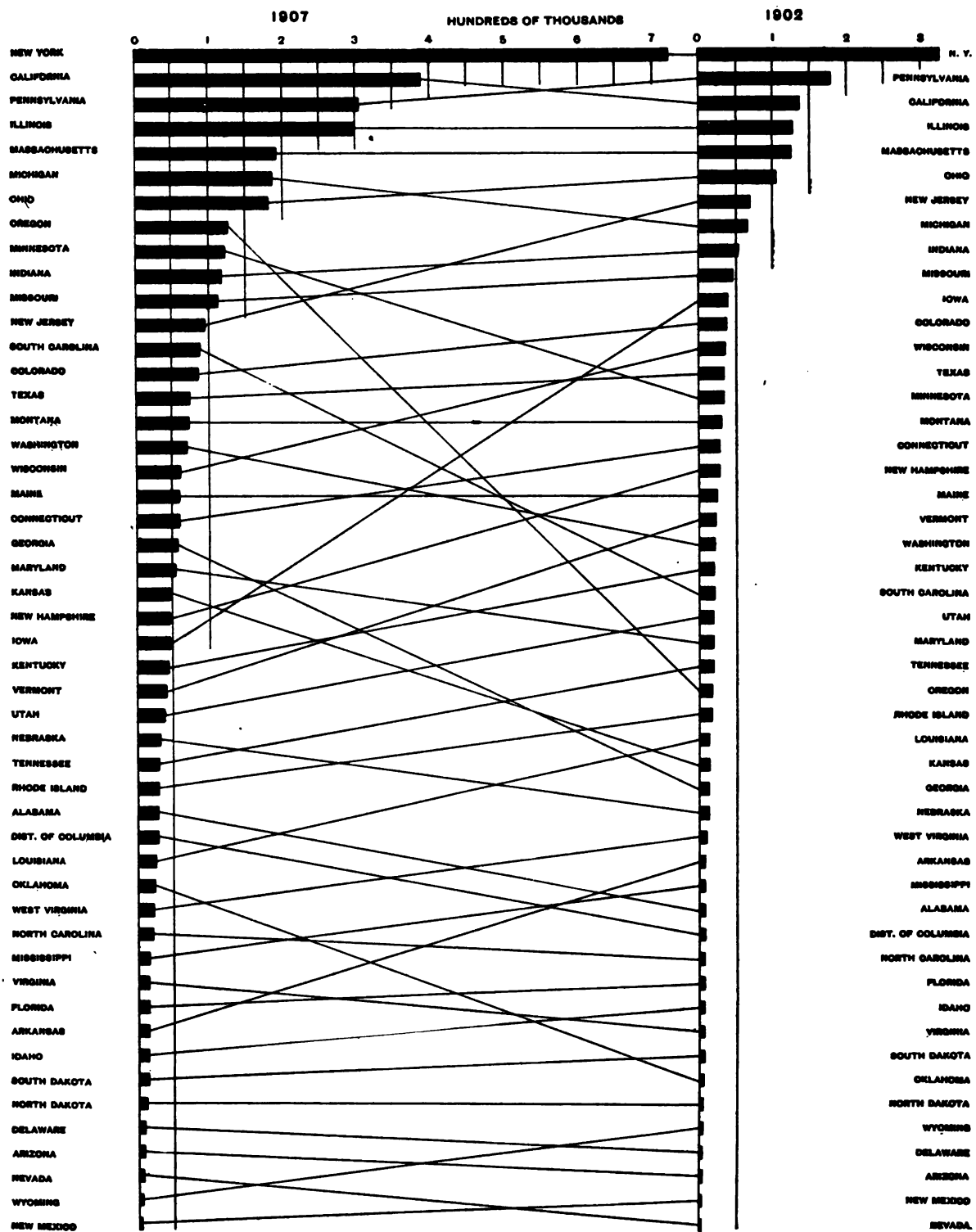


Table 22 shows the per cent distribution, by kind of power, of the primary-power equipment of commercial and municipal stations for 1907 and 1902.

TABLE 22.—Commercial and municipal central electric stations—Per cent distribution, by kind of primary-power machines: 1907 and 1902.

| KIND OF POWER.     | TOTAL. |                  | COMMERCIAL. |                  | MUNICIPAL. |                  |
|--------------------|--------|------------------|-------------|------------------|------------|------------------|
|                    | 1907   | 1902             | 1907        | 1902             | 1907       | 1902             |
| Total:             |        |                  |             |                  |            |                  |
| Number.....        | 100.0  | 100.0            | 100.0       | 100.0            | 100.0      | 100.0            |
| Horsepower.....    | 100.0  | 100.0            | 100.0       | 100.0            | 100.0      | 100.0            |
| Steam engines:     |        |                  |             |                  |            |                  |
| Number.....        | 62.1   | 75.5             | 57.3        | 73.2             | 83.5       | 88.6             |
| Horsepower.....    | 44.2   | 74.8             | 40.9        | 73.2             | 82.2       | 91.9             |
| Steam turbines:    |        |                  |             |                  |            |                  |
| Number.....        | 3.4    | ( <sup>1</sup> ) | 3.9         | ( <sup>1</sup> ) | 1.4        | ( <sup>1</sup> ) |
| Horsepower.....    | 19.9   | ( <sup>1</sup> ) | 21.1        | ( <sup>1</sup> ) | 6.0        | ( <sup>1</sup> ) |
| Gas engines:       |        |                  |             |                  |            |                  |
| Number.....        | 4.2    | 2.1              | 4.3         | 2.2              | 3.9        | 1.5              |
| Horsepower.....    | 1.4    | 0.7              | 1.3         | 0.7              | 1.9        | 0.6              |
| Water wheels:      |        |                  |             |                  |            |                  |
| Number.....        | 22.6   | 17.7             | 25.9        | 19.7             | 7.6        | 6.9              |
| Horsepower.....    | 32.9   | 23.8             | 34.9        | 25.4             | 9.4        | 7.0              |
| Auxiliary engines: |        |                  |             |                  |            |                  |
| Number.....        | 7.7    | 4.6              | 8.6         | 4.9              | 3.6        | 3.0              |
| Horsepower.....    | 1.6    | 0.8              | 1.7         | 0.8              | 0.5        | 0.5              |

<sup>1</sup> In 1902 steam turbines were included with steam engines.

Steam engines furnished the largest proportion of

horsepower for both the commercial and the municipal stations, but for each of the two classes of stations their relative importance has decreased considerably since 1902, while that of the water wheels and gas engines has increased. If a division of the primary power, including auxiliary power, be made into the three classes—steam, gas, and water—it is found that of the total power in central stations in 1907, 65.7 per cent was steam; 1.4 per cent, gas; and 32.9 per cent, water. The corresponding proportions for 1902 were: Steam, 75.6 per cent; gas, seven-tenths of 1 per cent; and water, 23.8 per cent. Of the proportion for steam in 1907, the commercial stations reported 58.8 per cent of the total primary power and the municipal stations 6.9 per cent. The corresponding proportions in 1902 were 67.6 per cent and 8 per cent, respectively.

*Steam engines and steam turbines.*—Inasmuch as steam turbines were not reported separately in 1902, they are, for comparative purposes, combined with steam engines for 1907 in Tables 23 and 24, which give detailed statistics of the steam-power equipment of commercial and municipal central stations for 1907 and 1902.

TABLE 23.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—STEAM ENGINES AND STEAM TURBINES, BY HORSEPOWER CAPACITY: 1907 AND 1902.

| CLASS OF ENGINES.                    | TOTAL.    |                  | COMMERCIAL. |                  | MUNICIPAL. |         | PER CENT OF INCREASE. |              |            |
|--------------------------------------|-----------|------------------|-------------|------------------|------------|---------|-----------------------|--------------|------------|
|                                      | 1907      | 1902             | 1907        | 1902             | 1907       | 1902    | Total.                | Com-mercial. | Municipal. |
| Total:                               |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 7,206     | 5,930            | 5,492       | 4,870            | 1,714      | 1,060   | 21.5                  | 12.8         | 61.7       |
| Horsepower.....                      | 2,627,450 | 1,379,941        | 2,344,032   | 1,232,923        | 283,418    | 147,018 | 90.4                  | 90.1         | 92.8       |
| 500 horsepower and under:            |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 6,248     | 5,451            | 4,584       | 4,407            | 1,664      | 1,044   | 14.6                  | 4.0          | 59.4       |
| Horsepower.....                      | 1,035,583 | 849,336          | 794,205     | 715,418          | 241,378    | 133,918 | 21.9                  | 11.0         | 80.2       |
| Over 500 but under 1,000 horsepower: |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 498       | 278              | 460         | 266              | 38         | 12      | 79.1                  | 72.9         | 216.7      |
| Horsepower.....                      | 345,158   | 193,570          | 318,818     | 184,670          | 26,340     | 8,900   | 78.3                  | 72.6         | 196.0      |
| 1,000 but under 2,000 horsepower:    |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 249       | 149              | 239         | 145              | 10         | 4       | 67.1                  | 64.8         | 150.0      |
| Horsepower.....                      | 316,588   | 187,485          | 306,188     | 183,285          | 10,400     | 4,200   | 68.9                  | 67.1         | 147.6      |
| 2,000 but under 5,000 horsepower:    |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 148       | 52               | 146         | 52               | 2          | .....   | 184.6                 | 180.8        | .....      |
| Horsepower.....                      | 407,695   | 149,550          | 402,395     | 149,550          | 5,300      | .....   | 172.6                 | 169.1        | .....      |
| 5,000 horsepower and over:           |           |                  |             |                  |            |         |                       |              |            |
| Number.....                          | 63        | ( <sup>1</sup> ) | 63          | ( <sup>1</sup> ) | .....      | .....   | .....                 | .....        | .....      |
| Horsepower.....                      | 522,426   | ( <sup>1</sup> ) | 522,426     | ( <sup>1</sup> ) | .....      | .....   | .....                 | .....        | .....      |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

The figures in Tables 23 and 24 show that the greatest increases have taken place in the horsepower of the largest types of steam engines. Of the total steam power reported for 1907, 35.4 per cent was represented by machines with a capacity of 2,000 horsepower or over, while machines of this type represented only 10.8 per cent of the steam power reported for 1902. In 1902, of the total steam power, 61.5 per cent was in the class of "500 horsepower and under," and in 1907 the proportion had decreased to 39.4 per

cent. The commercial stations naturally made the most marked gains in the large units of power, increasing from 12.1 per cent for the class of 2,000 and over in 1902 to 39.5 per cent in 1907, and decreasing from 58 per cent for the class of 500 or under in 1902 to 33.9 per cent in 1907. The municipal stations, although showing no marked changes in the relative proportions of the several classes, manifest a tendency toward the larger units of steam power.



TABLE 24.—Commercial and municipal central electric stations—  
Per cent distribution, by number and horsepower capacity of steam  
engines and steam turbines: 1907 and 1902.

| CLASS OF ENGINES.                         | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|-------------------------------------------|--------|-------|-------------|-------|------------|-------|
|                                           | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total:                                    |        |       |             |       |            |       |
| Number.....                               | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Horsepower.....                           | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| 500 horsepower and under:                 |        |       |             |       |            |       |
| Number.....                               | 86.7   | 91.9  | 83.5        | 90.5  | 97.1       | 98.5  |
| Horsepower.....                           | 39.4   | 61.5  | 33.9        | 58.0  | 85.2       | 91.1  |
| Over 500 but under 1,000 horse-<br>power: |        |       |             |       |            |       |
| Number.....                               | 6.9    | 4.7   | 8.4         | 5.5   | 2.2        | 1.1   |
| Horsepower.....                           | 13.1   | 14.0  | 13.6        | 15.0  | 9.3        | 6.1   |
| 1,000 but under 2,000 horse-<br>power:    |        |       |             |       |            |       |
| Number.....                               | 3.5    | 2.5   | 4.4         | 3.0   | 0.6        | 0.4   |
| Horsepower.....                           | 12.0   | 13.6  | 13.1        | 14.9  | 3.7        | 2.9   |
| 2,000 but under 5,000 horse-<br>power:    |        |       |             |       |            |       |
| Number.....                               | 2.1    | 0.9   | 2.7         | 1.1   | 0.1        | ..... |
| Horsepower.....                           | 15.5   | 10.8  | 17.2        | 12.1  | 1.9        | ..... |
| 5,000 horsepower and over:                |        |       |             |       |            |       |
| Number.....                               | 0.9    | (1)   | 1.1         | (1)   | .....      | ..... |
| Horsepower.....                           | 19.9   | (1)   | 22.3        | (1)   | .....      | ..... |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

There were only 3 states—Nevada, South Carolina, and Utah—for which a smaller amount of primary steam power was reported in 1907 than in 1902.

While only 9,964 steam horsepower was reported for these states in 1907 and 12,990 in 1902, it is interesting to note that for each state there was an increase in water power far greater than the decrease in steam power. In each of the following states the steam power reported for 1907 exceeded 100,000 horsepower: New York, 410,007 horsepower; Illinois, 286,958; Pennsylvania, 258,163; Ohio, 170,251; Massachusetts, 169,617; California, 133,299; and Missouri, 102,044. The total for these states amounted to 1,530,339 horsepower, or 58.2 per cent of the total steam power for all states.

The increase in the number and importance of the steam turbines makes it desirable to segregate the statistics for the two kinds of engines operated by steam, and Tables 25 and 26 show the totals and percentages for engines exclusive of steam turbines. The statistics for 1902, however, include the figures for a comparatively small number of steam turbines, because they were not deemed of sufficient importance to be reported separately for that year, and to this extent the comparison of the figures for the two census years is vitiated.

TABLE 25.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER AND HORSEPOWER OF STEAM  
ENGINES, EXCLUSIVE OF STEAM TURBINES: 1907 AND 1902.

| CLASS OF ENGINES.                    | TOTAL.    |           | COMMERCIAL. |           | MUNICIPAL. |         | PER CENT OF INCREASE. |                  |            |
|--------------------------------------|-----------|-----------|-------------|-----------|------------|---------|-----------------------|------------------|------------|
|                                      | 1907      | 1902      | 1907        | 1902      | 1907       | 1902    | Total.                | Commer-<br>cial. | Municipal. |
| Total:                               |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 6,829     | 5,930     | 5,144       | 4,870     | 1,685      | 1,060   | 15.2                  | 5.6              | 50.0       |
| Horsepower.....                      | 1,810,040 | 1,379,941 | 1,546,007   | 1,232,923 | 264,033    | 147,018 | 31.2                  | 25.4             | 79.6       |
| 500 horsepower and under:            |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 6,183     | 5,451     | 4,535       | 4,407     | 1,648      | 1,044   | 13.4                  | 2.9              | 57.9       |
| Horsepower.....                      | 1,018,566 | 849,336   | 781,673     | 715,418   | 236,893    | 133,918 | 19.9                  | 9.3              | 76.9       |
| Over 500 but under 1,000 horsepower: |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 375       | 278       | 342         | 266       | 33         | 12      | 34.9                  | 28.6             | 175.0      |
| Horsepower.....                      | 259,478   | 193,570   | 236,638     | 184,070   | 22,840     | 8,900   | 34.0                  | 28.1             | 156.6      |
| 1,000 but under 2,000 horsepower:    |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 182       | 149       | 178         | 145       | 4          | 4       | 22.1                  | 22.8             | .....      |
| Horsepower.....                      | 230,216   | 187,465   | 225,916     | 183,285   | 4,300      | 4,200   | 22.8                  | 23.3             | 2.4        |
| 2,000 but under 5,000 horsepower:    |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 70        | 52        | 70          | 52        | .....      | .....   | .....                 | .....            | .....      |
| Horsepower.....                      | 186,280   | 149,550   | 186,280     | 149,550   | .....      | .....   | .....                 | .....            | .....      |
| 5,000 horsepower and over:           |           |           |             |           |            |         |                       |                  |            |
| Number.....                          | 19        | (1)       | 19          | (1)       | .....      | .....   | .....                 | .....            | .....      |
| Horsepower.....                      | 115,500   | (1)       | 115,500     | (1)       | .....      | .....   | .....                 | .....            | .....      |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

While a considerable increase took place in the horsepower of the smaller engines in both classes of stations, it has not been sufficient to overcome the increase in the larger units. Therefore the relative importance of the engines of "500 horsepower and under" decreased from 61.5 per cent of the total in 1907 to 56.3 per cent in 1902, the greatest relative decrease, from 58 per cent to 50.6 per cent, occurring in the commercial stations, which contain all of the large engines.

As would naturally be expected, the municipal stations show no large steam engines. There were no machines of more than 2,000 horsepower reported for

such stations at either census, and only 4 that had an indicated horsepower of 1,000 and over. As a rule the municipal stations are small, and therefore contain a large proportion of the small machines.

Little change was shown in the proportion of engines of "Over 500 but under 1,000 horsepower," 14.3 per cent in 1907 and 14 per cent in 1902, but there was a decline in the proportion of engines of "1,000 but under 2,000 horsepower," from 13.6 per cent in 1902 to 12.7 per cent in 1907. As already indicated, a decided increase was manifest in the proportion of engines of over 2,000 horsepower, from 10.8 per cent in 1902 to 16.7 per cent in 1907.

DIAGRAM 4.—CENTRAL ELECTRIC STATIONS—STEAM AND WATER POWER, BY STATES, ARRANGED IN ORDER OF THEIR RELATIVE IMPORTANCE: 1907.

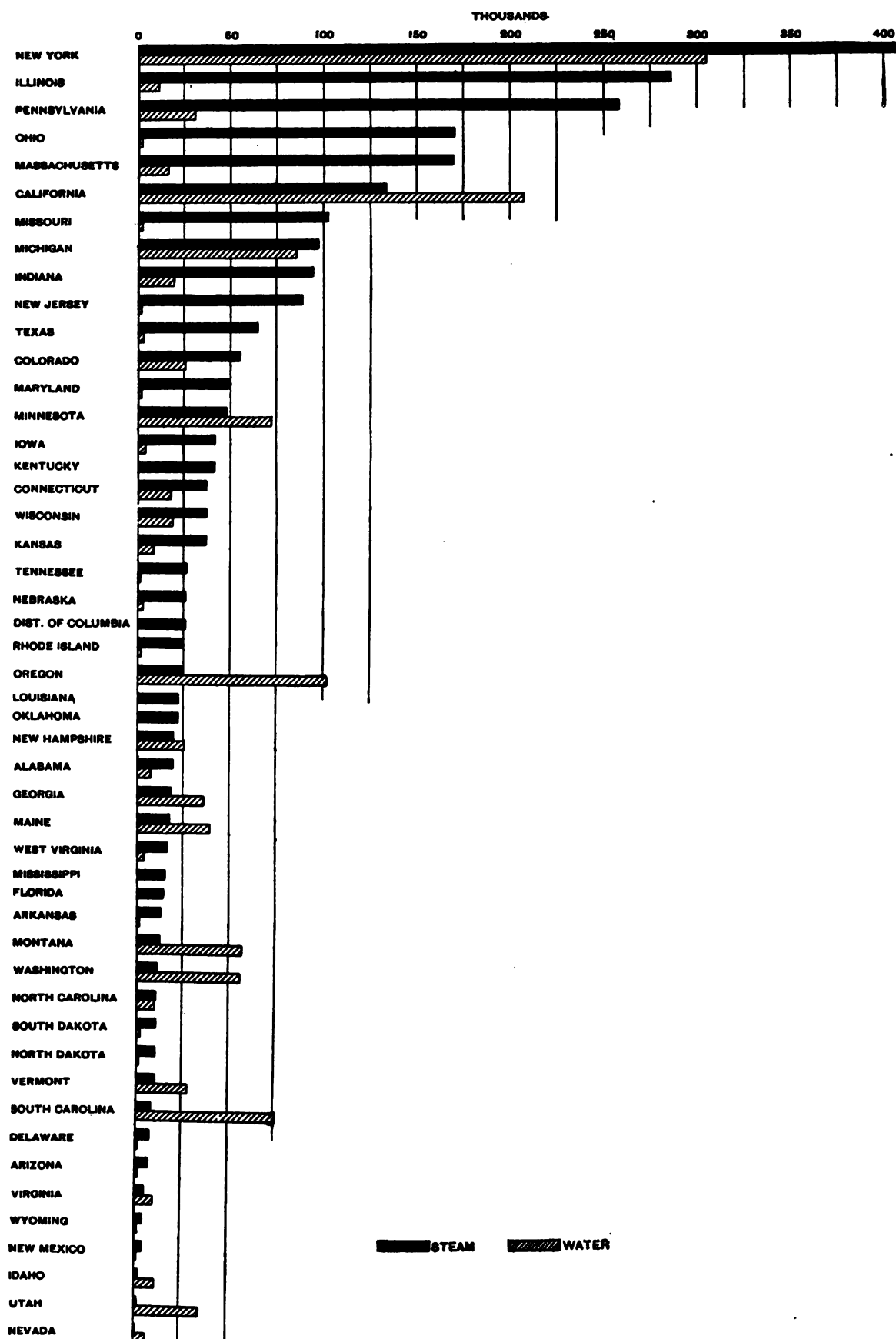


TABLE 26.—Commercial and municipal central electric stations—  
Per cent distribution, by number and horsepower capacity of steam  
engines, exclusive of steam turbines: 1907 and 1902.

| CLASS OF ENGINES.                         | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|-------------------------------------------|--------|-------|-------------|-------|------------|-------|
|                                           | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total:                                    |        |       |             |       |            |       |
| Number.....                               | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Horsepower.....                           | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| 500 horsepower and under:                 |        |       |             |       |            |       |
| Number.....                               | 90.5   | 91.9  | 88.2        | 90.5  | 97.8       | 98.5  |
| Horsepower.....                           | 56.3   | 61.5  | 50.6        | 58.0  | 89.7       | 91.1  |
| Over 500 but under 1,000 horse-<br>power: |        |       |             |       |            |       |
| Number.....                               | 5.5    | 4.7   | 6.6         | 5.5   | 2.0        | 1.1   |
| Horsepower.....                           | 14.3   | 14.0  | 15.3        | 15.0  | 8.7        | 6.1   |
| 1,000 but under 2,000 horse-<br>power:    |        |       |             |       |            |       |
| Number.....                               | 2.7    | 2.5   | 3.5         | 3.0   | 0.2        | 0.4   |
| Horsepower.....                           | 12.7   | 13.6  | 14.6        | 14.9  | 1.6        | 2.9   |
| 2,000 but under 5,000 horse-<br>power:    |        |       |             |       |            |       |
| Number.....                               | 1.0    | 0.9   | 1.4         | 1.1   | .....      | ..... |
| Horsepower.....                           | 10.3   | 10.8  | 12.0        | 12.1  | .....      | ..... |
| 5,000 horsepower and over:                |        |       |             |       |            |       |
| Number.....                               | 0.3    | (1)   | 0.4         | (1)   | .....      | ..... |
| Horsepower.....                           | 6.4    | (1)   | 7.5         | (1)   | .....      | ..... |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

Since all engines with an indicated horsepower of 2,000 or over were reported as a single group at the census of 1902, it is impracticable to determine the number and horsepower of the machines of 5,000 and over in operation in that year to compare with those reported in 1907. At the latter census these engines were distributed as follows: New York, 11 engines with 60,500 horsepower; California, 5 with 34,500; Pennsylvania, 1 with 8,000; Maryland, 1 with 7,500; and Illinois, 1 with 5,000.

*Steam turbines.*—These engines appear to be admirably adapted to central-station work, and although a number of engines of this type of small horsepower capacity were reported, it is evident from the statistics in Table 27 that the majority were of large horsepower and especially fitted to meet the requirements of large centers of distribution.

The municipal stations contained comparatively few steam turbines, the majority of which (55.2 per cent) were of the smaller type. The turbines of less than 2,000 horsepower, as shown in Table 27, formed 72.7 per cent of the total power of all these engines in the municipal stations and but 22 per cent of the power of those in the commercial stations. In commercial stations the large engines, those having over 2,000 horsepower, represented 78.1 per cent of the total turbine power. Practically one-half of the horsepower of the steam turbines was in units of 5,000 and over. The extent to which the steam turbine predominates among the machines of this largest capacity is indicated by the fact that in 1907 there were 44 turbines in this class, with a total of 406,926 horsepower, as compared with 19 steam engines of other types of 115,500 horsepower and 55 water wheels of

339,800 horsepower. Of the total for all kinds of primary power, excluding auxiliary engines, the steam turbine furnished 20.3 per cent as compared with 44.9 per cent for other classes of steam engines and 33.5 per cent for water wheels.

TABLE 27.—Commercial and municipal central electric stations—  
Number and horsepower of steam turbines, by horsepower capacity,  
with per cent distribution: 1907.<sup>1</sup>

| CLASS OF STEAM TURBINES.                | Total.  | Com-<br>mercial. | Munici-<br>pal. | PER CENT DISTRIBUTION. |                  |                 |
|-----------------------------------------|---------|------------------|-----------------|------------------------|------------------|-----------------|
|                                         |         |                  |                 | Total.                 | Com-<br>mercial. | Munici-<br>pal. |
| Total:                                  |         |                  |                 |                        |                  |                 |
| Number.....                             | 377     | 348              | 29              | 100.0                  | 100.0            | 100.0           |
| Horsepower.....                         | 817,410 | 798,025          | 19,385          | 100.0                  | 100.0            | 100.0           |
| 500 horsepower and under:               |         |                  |                 |                        |                  |                 |
| Number.....                             | 65      | 49               | 16              | 17.2                   | 14.1             | 55.2            |
| Horsepower.....                         | 17,017  | 12,532           | 4,485           | 2.1                    | 1.6              | 23.1            |
| Over 500 but under 1,000<br>horsepower: |         |                  |                 |                        |                  |                 |
| Number.....                             | 123     | 118              | 5               | 32.6                   | 33.9             | 17.2            |
| Horsepower.....                         | 85,680  | 82,180           | 3,500           | 10.5                   | 10.3             | 18.1            |
| 1,000 but under 2,000 horse-<br>power:  |         |                  |                 |                        |                  |                 |
| Number.....                             | 67      | 61               | 6               | 17.8                   | 17.5             | 20.7            |
| Horsepower.....                         | 86,372  | 80,272           | 6,100           | 10.6                   | 10.1             | 31.6            |
| 2,000 but under 5,000 horse-<br>power:  |         |                  |                 |                        |                  |                 |
| Number.....                             | 78      | 76               | 2               | 20.7                   | 21.8             | 6.9             |
| Horsepower.....                         | 221,415 | 216,115          | 5,300           | 27.1                   | 27.1             | 27.3            |
| 5,000 horsepower and over:              |         |                  |                 |                        |                  |                 |
| Number.....                             | 44      | 44               | .....           | 11.7                   | 12.6             | .....           |
| Horsepower.....                         | 406,926 | 406,926          | .....           | 49.8                   | 51.0             | .....           |

<sup>1</sup> Comparison with 1902 impracticable, since in that year steam turbines were included with steam engines.

Steam turbines were reported as in use in some of the central stations of all the states and territories, except Virginia, North Carolina, South Carolina, North Dakota, Idaho, Utah, Nevada, and New Mexico. In all these states together only 41,130 steam horsepower was reported for the stations, and it is evident that water power, of which 147,979 horsepower was reported, was more economical, or that the business did not justify or require the installation of turbines.

Nearly one-half (48.2 per cent) of the horsepower of the steam turbines was contained in 3 states—New York, Illinois, and Massachusetts. New York alone reported 24.9 per cent of this class of power, while as between steam engines and steam turbines in that state the latter represented 49.7 per cent of their total horsepower. Of the total steam power in Illinois, 48.3 per cent was reported for steam turbines, while of the total in Massachusetts, the proportion contributed by steam turbines was considerably less, 30.3 per cent. Although steam turbines were in use in 187 stations, in only 18 were they the sole primary power.

That the steam turbine is specially adapted to large centers of distribution will be seen from Table 28.

More than three-fifths of the horsepower reported for steam turbines was found in the 14 cities named, and their 90 engines showed the enormous average of 5,559 horsepower, as compared with an average of 2,168 for the country as a whole.

TABLE 28.—*Central electric stations in selected cities—Number and horsepower of steam turbines: 1907.*

| CITY.                          | Number. | Horsepower. | Per cent distribution. |
|--------------------------------|---------|-------------|------------------------|
| Total for United States.....   | 377     | 817,410     | 100.0                  |
| Total for selected cities..... | 90      | 500,335     | 61.2                   |
| New York.....                  | 22      | 170,600     | 20.9                   |
| Chicago.....                   | 10      | 116,500     | 14.3                   |
| St. Louis.....                 | 10      | 38,882      | 4.8                    |
| Boston.....                    | 3       | 30,000      | 3.7                    |
| Philadelphia.....              | 7       | 25,468      | 3.1                    |
| Los Angeles.....               | 6       | 25,360      | 3.1                    |
| Cleveland.....                 | 6       | 22,000      | 2.7                    |
| Washington.....                | 4       | 21,000      | 2.6                    |
| Baltimore.....                 | 6       | 10,200      | 1.2                    |
| Louisville.....                | 2       | 9,000       | 1.1                    |
| Denver.....                    | 4       | 8,525       | 1.0                    |
| Indianapolis.....              | 5       | 7,800       | 1.0                    |
| Cincinnati.....                | 1       | 7,500       | 0.9                    |
| Hartford.....                  | 4       | 7,500       | 0.9                    |

*Gas engines.*—The 463 engines denominated as gas engines in Table 21, with a total of 55,828 horsepower, are composed of 294 gas engines, with 45,330 horsepower; 136 gasoline engines, with 4,313 horsepower; and 33 oil engines, with 6,185 horsepower. These machines were used in 294 stations, of which 180, with 292 engines and a total of 23,487 horsepower, were operated wholly by machines of this class. Of these 180 stations, 137, with 19,532 horsepower, were commercial stations, and 43, with 3,955 horsepower, municipal stations. Although the proportion of the total horsepower in central stations which is represented by the gas engines is comparatively small (1.4 per cent of the total primary power), the number and importance of the gas engines have nevertheless increased largely since 1902. As a rule these engines are of a small type and their use has been confined largely to small plants. Lately, however, a larger type of machine is coming into use, and one commercial station operated 3 gas engines, with a total of 16,200 horsepower, which furnished motive power to operate 3 dynamos of slightly less than 4,000 kilowatts each. The exact size of each engine was not reported on the census schedule, but it appears that the smallest engine in this class shown as connected with a generator is one of 6 horsepower, which operated a 3-kilowatt dynamo. California reported gas engines with a total of 16,585 horsepower, or 29.7 per cent of the total of this class of primary power; Pennsylvania reported 7,469 horsepower; Ohio, 5,628; New York, 3,315; Texas, 3,058; and Wisconsin, 2,079. The horsepower of the gas engines of these 6 states amounted to 38,134 and formed 68.3 per cent of the total horsepower reported for all gas engines in both commercial and municipal stations.

*Internal-combustion oil engines.*—At the census of 1907, 18 stations reported the use of oil engines of the internal-combustion type, similar in character to the gas engine, with 6,185 horsepower; and 10 stations,

with 18 of these engines, relied upon them entirely for primary power. The following tabular statement shows the states in which these stations are located:

*Internal-combustion oil engines—Number and horsepower, by states: 1907.*

| STATE.             | Number of stations. | ENGINES. |             |
|--------------------|---------------------|----------|-------------|
|                    |                     | Number.  | Horsepower. |
| Total.....         | 18                  | 33       | 6,185       |
| Connecticut.....   | 2                   | 4        | 600         |
| Illinois.....      | 1                   | 2        | 240         |
| Louisiana.....     | 1                   | 1        | 170         |
| Massachusetts..... | 2                   | 3        | 570         |
| New Hampshire..... | 2                   | 3        | 550         |
| New Jersey.....    | 1                   | 1        | 270         |
| New York.....      | 1                   | 1        | 170         |
| Ohio.....          | 2                   | 4        | 900         |
| Pennsylvania.....  | 1                   | 2        | 190         |
| Rhode Island.....  | 1                   | 4        | 1,000       |
| Texas.....         | 3                   | 7        | 1,450       |
| Wisconsin.....     | 1                   | 1        | 75          |

*Water power.*—The ease with which electric current may be transmitted long distances and the economy connected with its generation by the use of water power have not only greatly increased the amount of this kind of power in 1907 as compared with 1902, but indicate its continued development. The statistics represent only the central stations that were in actual operation during the respective census years. The construction of hydro-electric plants is proceeding rapidly; a number were under construction during 1907 but had not commenced operations before the close of the year; and the Bureau of the Census was advised also that extensive water-power plants were contemplated in various sections of the country. The exhaustion of the fuel supply will further stimulate the erection of these plants, but naturally their increase will be slowest in the states where fuel is most abundant.

The horsepower of the water wheels in the central stations during 1907 was more than three times as great as it was in 1902. Although the actual increase was less than that for steam power, its proportion of the total primary power, excluding auxiliary engines, increased from 24 to 33.5 per cent, while the proportion for steam power shows a nearly corresponding decrease, from 75.4 per cent in 1902 to 65.2 per cent in 1907. The greatest increase occurred in the commercial stations, which contained 97.4 per cent of the water power in 1902 and 97.8 per cent in 1907.

As with steam power, the increase in water power is due primarily to the installation of large units of 2,000 horsepower and over. The increase in the capacity of these machines represented 61.9 per cent of the total increase in water power. In other words, the large water wheels furnished about three-fifths and the small wheels two-fifths of the increase.

**TABLE 29.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER AND HORSEPOWER OF WATER WHEELS, BY HORSEPOWER CAPACITY: 1907 AND 1902.**

| CLASS OF ENGINES.                    | TOTAL     |                  | COMMERCIAL |                  | MUNICIPAL |        | PER CENT OF INCREASE. |                  |                 |
|--------------------------------------|-----------|------------------|------------|------------------|-----------|--------|-----------------------|------------------|-----------------|
|                                      | 1907      | 1902             | 1907       | 1902             | 1907      | 1902   | Total.                | Commer-<br>cial. | Munici-<br>pal. |
| Total:                               |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 2,481     | 1,390            | 2,328      | 1,308            | 153       | 82     | 78.5                  | 78.0             | 86.3            |
| Horsepower.....                      | 1,349,067 | 438,472          | 1,318,740  | 427,254          | 30,347    | 11,218 | 207.7                 | 208.7            | 170.5           |
| 500 horsepower and under:            |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 1,910     | 1,192            | 1,761      | 1,112            | 149       | 80     | 60.2                  | 58.4             | 86.2            |
| Horsepower.....                      | 320,686   | 174,559          | 296,689    | 164,981          | 23,947    | 9,578  | 83.7                  | 79.8             | 150.0           |
| Over 500 but under 1,000 horsepower: |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 244       | 85               | 243        | 84               | 1         | 1      | 187.1                 | 189.3            | .....           |
| Horsepower.....                      | 161,051   | 57,160           | 160,251    | 56,530           | 800       | 640    | 181.8                 | 183.5            | 25.0            |
| 1,000 but under 2,000 horsepower:    |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 161       | 81               | 160        | 80               | 1         | 1      | 98.8                  | 100.0            | .....           |
| Horsepower.....                      | 196,620   | 99,453           | 195,420    | 98,453           | 1,200     | 1,000  | 97.7                  | 98.5             | 20.0            |
| 2,000 but under 5,000 horsepower:    |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 111       | 32               | 109        | 32               | 2         | .....  | 246.9                 | 240.6            | .....           |
| Horsepower.....                      | 330,980   | 107,300          | 326,580    | 107,300          | 4,400     | .....  | 208.5                 | 204.4            | .....           |
| 5,000 horsepower and over:           |           |                  |            |                  |           |        |                       |                  |                 |
| Number.....                          | 55        | ( <sup>1</sup> ) | 55         | ( <sup>1</sup> ) | .....     | .....  | .....                 | .....            | .....           |
| Horsepower.....                      | 339,800   | ( <sup>1</sup> ) | 339,800    | ( <sup>1</sup> ) | .....     | .....  | .....                 | .....            | .....           |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

The municipal stations contained only 3 of the water wheels with 1,000 horsepower and over in 1907 and but 1 in 1902. This small number of large wheels is, however, natural, as municipal plants are generally constructed for the purpose of supplying current to a single community and often for a specific purpose, and the equipment is limited to the probable needs of that community or purpose. Commercial plants, on the other hand, are constructed upon a broader, larger plan and are therefore more frequently designed to furnish current to any place to which it can be delivered at a profit.

**TABLE 30.—Commercial and municipal central electric stations—Per cent distribution, by number and horsepower capacity of water wheels: 1907 and 1902.**

| CLASS OF WATER WHEELS.                    | TOTAL. |                  | COMMERCIAL. |                  | MUNICIPAL. |       |
|-------------------------------------------|--------|------------------|-------------|------------------|------------|-------|
|                                           | 1907   | 1902             | 1907        | 1902             | 1907       | 1902  |
| Total:                                    |        |                  |             |                  |            |       |
| Number.....                               | 100.0  | 100.0            | 100.0       | 100.0            | 100.0      | 100.0 |
| Horsepower.....                           | 100.0  | 100.0            | 100.0       | 100.0            | 100.0      | 100.0 |
| 500 horsepower and under:                 |        |                  |             |                  |            |       |
| Number.....                               | 77.0   | 85.8             | 75.6        | 85.0             | 97.4       | 97.6  |
| Horsepower.....                           | 23.8   | 39.8             | 22.5        | 38.6             | 78.9       | 85.4  |
| Over 500 but under 1,000 horse-<br>power: |        |                  |             |                  |            |       |
| Number.....                               | 9.8    | 6.1              | 10.4        | 6.4              | 0.7        | 1.2   |
| Horsepower.....                           | 11.9   | 13.0             | 12.2        | 13.2             | 2.6        | 5.7   |
| 1,000 but under 2,000 horse-<br>power:    |        |                  |             |                  |            |       |
| Number.....                               | 6.5    | 5.8              | 6.9         | 6.1              | 0.7        | 1.2   |
| Horsepower.....                           | 14.6   | 22.7             | 14.8        | 23.0             | 4.0        | 8.9   |
| 2,000 but under 5,000 horse-<br>power:    |        |                  |             |                  |            |       |
| Number.....                               | 4.5    | 2.3              | 4.7         | 2.4              | 1.3        | ..... |
| Horsepower.....                           | 24.5   | 24.5             | 24.8        | 25.1             | 14.5       | ..... |
| 5,000 horsepower and over:                |        |                  |             |                  |            |       |
| Number.....                               | 2.2    | ( <sup>1</sup> ) | 2.4         | ( <sup>1</sup> ) | .....      | ..... |
| Horsepower.....                           | 25.2   | ( <sup>1</sup> ) | 25.8        | ( <sup>1</sup> ) | .....      | ..... |

<sup>1</sup> Included in "2,000 but under 5,000 horsepower." The class "5,000 horsepower and over" not called for at the census of 1902.

With the exception of Kentucky and North Dakota, in which states very little water power is utilized in electric plants, every state that reported water power in 1902 showed an increased use of such power in 1907. Alabama, Arizona, and Delaware had no central stations operated by water power in 1902, but each contained stations so equipped in 1907. Some of the

most marked gains in water power occurred in the following states: New York, from 128,785 horsepower in 1902 to 305,950 in 1907; California, from 78,933 to 208,444; Oregon, 11,195 to 102,052; Michigan, 16,085 to 85,738; Minnesota, 6,040 to 71,656; South Carolina, 10,415 to 75,430; Washington, 17,238 to 56,118; Montana, 24,000 to 56,987; and Georgia, 6,121 to 36,335. The water power reported by these 9 states represented 68.1 per cent of the total of this kind of primary power for all central stations in the United States in 1902 and 74 per cent in 1907. No water power was reported by the central stations in Florida, Louisiana, Mississippi, Oklahoma, or the District of Columbia.

For the purpose of comparing the average horsepower both of the stations as equipped with the various kinds of primary power and of the different classes of machines reported in 1907 and in 1902 the following table is given:

**TABLE 31.—Commercial and municipal central electric stations—Average horsepower, per station and per machine, of primary power: 1907 and 1902.**

| KIND OF POWER.                         | TOTAL. |                  | COMMERCIAL. |                  | MUNICIPAL. |                  |
|----------------------------------------|--------|------------------|-------------|------------------|------------|------------------|
|                                        | 1907   | 1902             | 1907        | 1902             | 1907       | 1902             |
| Total power:                           |        |                  |             |                  |            |                  |
| Per station.....                       | 869    | 510              | 1,091       | 601              | 257        | 196              |
| Per machine.....                       | 373    | 236              | 421         | 253              | 159        | 134              |
| Steam engines and steam tur-<br>bines: |        |                  |             |                  |            |                  |
| Per station.....                       | 675    | 445              | 844         | 523              | 254        | 196              |
| Per machine.....                       | 365    | 233              | 427         | 253              | 165        | 139              |
| Steam engines:                         |        |                  |             |                  |            |                  |
| Per station.....                       | 490    | 445              | 563         | 523              | 240        | 196              |
| Per machine.....                       | 265    | 233              | 301         | 253              | 157        | 139              |
| Steam turbines:                        |        |                  |             |                  |            |                  |
| Per station.....                       | 4,371  | ( <sup>1</sup> ) | 4,694       | ( <sup>1</sup> ) | 1,140      | ( <sup>1</sup> ) |
| Per machine.....                       | 2,168  | ( <sup>1</sup> ) | 2,293       | ( <sup>1</sup> ) | 668        | ( <sup>1</sup> ) |
| Gas engines:                           |        |                  |             |                  |            |                  |
| Per station.....                       | 190    | 121              | 209         | 131              | 109        | 64               |
| Per machine.....                       | 121    | 74               | 129         | 76               | 78         | 53               |
| Water wheels:                          |        |                  |             |                  |            |                  |
| Per station.....                       | 1,483  | 756              | 1,606       | 806              | 341        | 224              |
| Per machine.....                       | 544    | 315              | 566         | 327              | 198        | 137              |
| Auxiliary engines:                     |        |                  |             |                  |            |                  |
| Per station.....                       | 201    | 72               | 228         | 78               | 33         | 32               |
| Per machine.....                       | 78     | 40               | 83          | 41               | 21         | 23               |

<sup>1</sup> In 1902 steam turbines were included with steam engines.

Except for the comparatively unimportant auxiliary engines reported by municipal stations, in which there was a small decrease in horsepower per machine, there was in every instance a pronounced increase per station and per machine for the total, for all machines, and for each class of machine reported at both censuses. The smallest increase in total average capacity is shown for steam engines which, when compared with the large average power of the steam turbines, indicates that when great units of steam power have been required the steam turbine has been utilized. It is apparent, however, that since the figures for steam turbines were combined with those for steam engines in 1902 a correct understanding of the relative averages can be obtained only by the addition of the two sets of figures for 1907. The averages thus secured, for the totals of this combination, show that the increase in steam power has been on a par with that of the other kinds of primary power.

As might be expected, every class of machine reported by the commercial stations not only averaged much larger than those of the municipal stations but the increase in capacity also was greater.

The averages contained in Table 31 are based upon the horsepower as shown in Table 21, while the number of stations reporting the various kinds of power is shown in the following statement:

*Commercial and municipal central electric stations—Distribution by number of stations, and kinds of primary power: 1907 and 1902.*

| KIND OF POWER.         | Census.      | Total.                  | Commercial.             | Municipal.             |
|------------------------|--------------|-------------------------|-------------------------|------------------------|
| Steam engines.....     | 1907<br>1902 | 3,704<br>3,100          | 2,608<br>2,358          | 1,098<br>744           |
| Steam turbines.....    | 1907<br>1902 | 187<br>( <sup>1</sup> ) | 170<br>( <sup>1</sup> ) | 17<br>( <sup>1</sup> ) |
| Gas engines.....       | 1907<br>1902 | 294<br>101              | 238<br>86               | 56<br>15               |
| Water wheels.....      | 1907<br>1902 | 910<br>580              | 821<br>530              | 89<br>50               |
| Auxiliary engines..... | 1907<br>1902 | 328<br>201              | 282<br>175              | 46<br>26               |

<sup>1</sup> In 1902 steam turbines were included with steam engines.

A total of the number of stations in this statement would be in excess of the actual number reported, since a station having several kinds of power would be repeated under each class of power with which it was equipped.

*Dynamos, central stations, and electric railways.*—The electric-generating machines in the central stations and electric-railway plants represent the majority of those in use in the United States, and in order to show statistics for the aggregate the totals for the two branches of the industry are combined in Table 32.

TABLE 32.—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—NUMBER AND KILOWATT CAPACITY OF DYNAMOS IN GENERATING STATIONS, BY KIND OF DYNAMO: 1907 AND 1902.

| KIND OF DYNAMO.                                 | TOTAL.    |           | CENTRAL STATIONS. |           | ELECTRIC RAILWAYS. |                  | PER CENT OF INCREASE. |                   |                    |
|-------------------------------------------------|-----------|-----------|-------------------|-----------|--------------------|------------------|-----------------------|-------------------|--------------------|
|                                                 | 1907      | 1902      | 1907              | 1902      | 1907               | 1902             | Total.                | Central stations. | Electric railways. |
| Total:                                          |           |           |                   |           |                    |                  |                       |                   |                    |
| Number.....                                     | 15,297    | 15,786    | 12,173            | 12,484    | 3,124              | 3,302            | 13.1                  | 12.5              | 15.4               |
| Kilowatt capacity.....                          | 4,432,641 | 2,110,597 | 2,706,225         | 1,212,235 | 1,723,416          | 898,362          | 110.0                 | 123.5             | 91.8               |
| Direct-current, constant-voltage:               |           |           |                   |           |                    |                  |                       |                   |                    |
| Number.....                                     | 5,872     | 6,684     | 3,680             | 3,823     | 2,192              | 2,861            | 112.1                 | 13.7              | 123.4              |
| Kilowatt capacity.....                          | 1,347,962 | 1,055,411 | 406,460           | 330,065   | 941,502            | 725,346          | 27.7                  | 23.1              | 29.8               |
| Direct-current, constant-amperage:              |           |           |                   |           |                    |                  |                       |                   |                    |
| Number.....                                     | 1,685     | 3,539     | 1,685             | 3,539     | ( <sup>2</sup> )   | ( <sup>2</sup> ) | 152.4                 | 152.4             | ( <sup>2</sup> )   |
| Kilowatt capacity.....                          | 80,992    | 145,866   | 80,992            | 145,866   | ( <sup>2</sup> )   | ( <sup>2</sup> ) | 144.5                 | 144.5             | ( <sup>2</sup> )   |
| Alternating single-phase and polyphase current: |           |           |                   |           |                    |                  |                       |                   |                    |
| Number.....                                     | 7,740     | 5,563     | 6,808             | 5,122     | 932                | 441              | 59.1                  | 32.9              | 111.3              |
| Kilowatt capacity.....                          | 3,003,687 | 909,320   | 2,221,773         | 736,304   | 781,914            | 173,016          | 230.3                 | 201.7             | 351.9              |

<sup>1</sup> Decrease.

<sup>2</sup> Not reported.

With the exception of the dynamos in the isolated electric plants and telephone and telegraph offices, which are comparatively unimportant, the equipment covered by this table may be accepted as representing all dynamos used for the generation of electricity for general commercial and municipal use.

The total dynamo capacity as reported for the combined industry increased 2,322,044 kilowatts, or 110 per cent, of which increase the central stations contributed 1,496,990 kilowatts, or 64.5 per cent, and the electric-railway plants 825,054 kilowatts, or 35.5 per cent. It is suggestive of the intimate relation existing between the electric generators and the pri-

mary power, the force necessary to operate the dynamos, that the percentage of increase of the primary power, 106.5 per cent, should so closely approximate that of the dynamos, which was 110 per cent. The evenness of these gains is somewhat remarkable, because both for primary power and for the generators the totals represent the equipment, all of which is not necessary for present requirements. That is, the primary power no doubt represents a larger horsepower than was actually required for electrical purposes at the time of the census, as in many instances plants were equipped to furnish power in connection with other industries conducted by the companies report-

ing, as well as with a view to future demands, emergency uses, etc. Similarly the total installation of dynamos represents not only the dynamos required to generate the current actually used, but includes those held in reserve to furnish additional current when needed and to provide for breakdowns or repairs.

Of the total number of dynamos reported, the proportion in central stations was practically the same at the two censuses, i. e., 79.6 per cent in 1907 and 79.1 per cent in 1902. The proportion of kilowatt capacity of the dynamos in the central stations increased, however, from 57.4 per cent in 1902 to 61.1 per cent in 1907.

The direct-current, constant-voltage dynamos showed a total increase in capacity of 292,551 kilowatts, or 27.7 per cent, the greater part of which increase, 216,156 kilowatts, or 73.9 per cent, was for electric railways, while but 76,395, or 26.1 per cent, was contributed by the central stations. Of the total kilowatt capacity of these machines, the electric-railway plants reported nearly seven-tenths in 1907 and a proportion but slightly smaller in 1902.

The direct-current, constant-amperage machine was not reported by the electric-railway plants, as it is not adapted to that service, and the uses of the machine are so restricted that comparatively few companies doing a general light and power business feel justified in carrying a class of dynamo only fitted for series arc lighting. The number of this class of dynamos reported by the central stations in 1907 was less than one-half the number so reported in 1902, and the decrease in their total capacity amounted to 64,874 kilowatts, or 44.5 per cent.

The alternating single-phase and polyphase current dynamo showed the largest actual and percentage of gain, due to the fact that it is adapted to almost every use required of a dynamo. The total capacity of these machines increased 2,094,367 kilowatts, or 230.3 per cent. Of this gain, 1,485,469 kilowatts, or 70.9 per cent, was represented by the central stations. Electric-railway plants reported a little more than one-fourth of the total capacity of these dynamos in 1907 and not quite one-fifth in 1902.

Table 33 shows the per cent distribution, by kind, of the dynamos in the central stations and electric-railway plants for 1902 and 1907.

Notwithstanding the increase of 27.7 per cent in the total capacity of the direct-current, constant-voltage dynamos in 1907, they represented only about three-tenths of the total capacity of all classes of dynamos in that year as compared with one-half of the total in 1902. The capacity of the alternating-current dynamos, which in 1902 represented but

little more than four-tenths of the total for all classes, had increased its proportion to more than two-thirds in 1907. The direct-current, constant-amperage dynamos, as already stated, were all reported by the central stations, and the small proportion which they supplied of the total kilowatt capacity decreased from nearly 7 per cent in 1902 to slightly less than 2 per cent in 1907.

TABLE 33.—*Central electric stations and electric railways—Per cent distribution, by kind and by number and capacity of dynamos: 1907 and 1902.*

| KIND OF DYNAMO.                                 | TOTAL. |       | CENTRAL STATIONS. |       | ELECTRIC RAILWAYS. |       |
|-------------------------------------------------|--------|-------|-------------------|-------|--------------------|-------|
|                                                 | 1907   | 1902  | 1907              | 1902  | 1907               | 1902  |
| Total:                                          |        |       |                   |       |                    |       |
| Number.....                                     | 100.0  | 100.0 | 100.0             | 100.0 | 100.0              | 100.0 |
| Kilowatt capacity...                            | 100.0  | 100.0 | 100.0             | 100.0 | 100.0              | 100.0 |
| Direct-current, constant-voltage:               |        |       |                   |       |                    |       |
| Number.....                                     | 38.4   | 42.3  | 30.2              | 30.6  | 70.2               | 86.6  |
| Kilowatt capacity.....                          | 30.4   | 50.0  | 15.0              | 27.2  | 54.6               | 80.7  |
| Direct-current, constant-amperage:              |        |       |                   |       |                    |       |
| Number.....                                     | 11.0   | 22.4  | 13.8              | 28.3  | (1)                | (1)   |
| Kilowatt capacity.....                          | 1.8    | 6.9   | 8.0               | 12.0  | (1)                | (1)   |
| Alternating single-phase and polyphase current: |        |       |                   |       |                    |       |
| Number.....                                     | 50.6   | 35.2  | 55.9              | 41.0  | 29.8               | 13.4  |
| Kilowatt capacity.....                          | 67.8   | 43.1  | 82.0              | 60.7  | 45.4               | 19.3  |

<sup>1</sup> Not reported by electric railways.

*Dynamos in central stations.*—As compared with the total kilowatt capacity of all dynamos reported in 1902 there was an increase in 1907 of 1,496,990 kilowatts, or 123.5 per cent. Of this increase, the commercial stations reported 1,401,354 kilowatts, or 93.6 per cent, and the municipal stations only 95,636 kilowatts, or 6.4 per cent. In 1907 the commercial stations reported 92.3 per cent of the total dynamo capacity and the municipal stations 7.7 per cent. When compared with similar proportions for the prior census it is found that the percentage for the commercial stations was 1.7 per cent greater than in 1902.

The increase in the number and in the capacity of the dynamos of the different kinds in commercial and municipal stations is shown by the figures in Table 34, while Table 35 gives the per cent distribution of such dynamos, by kind, for 1907 and 1902.

The advantages possessed by the alternating-current dynamo and its adaptability for general central-station work is illustrated by the tremendous gain in its use. Practically the entire increase in dynamo capacity was due to the gain made by the alternating-current machine, as the direct-current, constant-amperage machines lost 64,874 in kilowatt capacity, which was but little more than counterbalanced by a gain of 76,395 kilowatts in the capacity of the direct-current, constant-voltage machines.

TABLE 34.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER AND KILOWATT CAPACITY OF DYNAMOS IN GENERATING STATIONS, BY KIND OF DYNAMO: 1907 AND 1902.

| KIND OF DYNAMO.                                 | TOTAL.    |           | COMMERCIAL. |           | MUNICIPAL. |         | PER CENT OF INCREASE. |             |            |
|-------------------------------------------------|-----------|-----------|-------------|-----------|------------|---------|-----------------------|-------------|------------|
|                                                 | 1907      | 1902      | 1907        | 1902      | 1907       | 1902    | Total.                | Commercial. | Municipal. |
| Total:                                          |           |           |             |           |            |         |                       |             |            |
| Number.....                                     | 12,173    | 12,484    | 9,778       | 10,662    | 2,395      | 1,822   | 12.5                  | 18.3        | 31.4       |
| Kilowatt capacity.....                          | 2,709,225 | 1,212,235 | 2,500,209   | 1,098,855 | 209,016    | 113,380 | 123.5                 | 127.5       | 84.3       |
| Direct-current, constant-voltage:               |           |           |             |           |            |         |                       |             |            |
| Number.....                                     | 3,680     | 3,823     | 3,169       | 3,405     | 511        | 418     | 13.7                  | 16.9        | 22.2       |
| Kilowatt capacity.....                          | 406,460   | 330,065   | 379,706     | 312,509   | 26,754     | 17,556  | 23.1                  | 21.5        | 52.4       |
| Direct-current, constant-amperage:              |           |           |             |           |            |         |                       |             |            |
| Number.....                                     | 1,685     | 3,539     | 1,246       | 2,957     | 439        | 582     | 152.4                 | 157.9       | 124.6      |
| Kilowatt capacity.....                          | 80,992    | 145,866   | 61,753      | 117,695   | 19,239     | 28,171  | 144.5                 | 147.5       | 131.7      |
| Alternating single-phase and polyphase current: |           |           |             |           |            |         |                       |             |            |
| Number.....                                     | 6,808     | 5,122     | 5,363       | 4,300     | 1,445      | 822     | 32.9                  | 24.7        | 75.8       |
| Kilowatt capacity.....                          | 2,221,773 | 736,304   | 2,058,750   | 668,651   | 163,023    | 67,653  | 201.7                 | 207.9       | 141.0      |

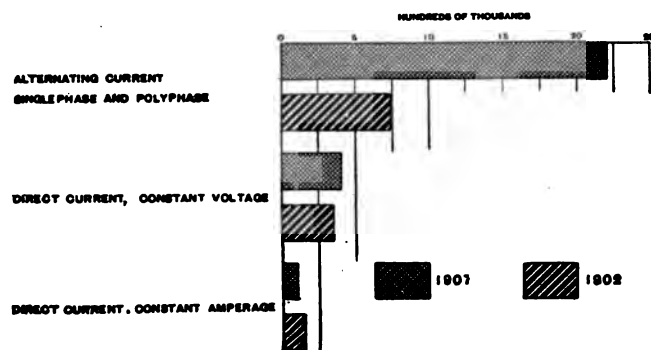
1 Decrease.

Although the kilowatt capacity of the direct-current, constant-voltage dynamos had increased nearly one-fourth since 1902, the relative importance of these machines was considerably less in 1907. The number and capacity of the direct-current, constant-amperage dynamos has decreased since 1902, as has their relative importance.

TABLE 35.—Commercial and municipal central electric stations—Per cent distribution, by kind and by number and capacity of dynamos: 1907 and 1902.

| KIND OF DYNAMO.                                 | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|-------------------------------------------------|--------|-------|-------------|-------|------------|-------|
|                                                 | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total:                                          |        |       |             |       |            |       |
| Number.....                                     | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Kilowatt capacity...                            | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Direct-current, constant-voltage:               |        |       |             |       |            |       |
| Number.....                                     | 30.2   | 30.6  | 32.4        | 31.9  | 21.3       | 22.9  |
| Kilowatt capacity.....                          | 15.0   | 27.2  | 15.2        | 28.4  | 12.8       | 15.5  |
| Direct-current, constant-amperage:              |        |       |             |       |            |       |
| Number.....                                     | 13.8   | 28.3  | 12.7        | 27.7  | 18.3       | 31.9  |
| Kilowatt capacity.....                          | 3.0    | 12.0  | 2.5         | 10.7  | 9.2        | 24.8  |
| Alternating single-phase and polyphase current: |        |       |             |       |            |       |
| Number.....                                     | 55.9   | 41.0  | 54.8        | 40.3  | 60.3       | 45.1  |
| Kilowatt capacity.....                          | 82.0   | 60.7  | 82.3        | 60.8  | 78.0       | 59.7  |

DIAGRAM 5.—Central electric stations—Capacity of dynamos: 1907 and 1902.



The average capacity of the different types of dynamos per station and per machine for commercial and municipal stations, 1907 and 1902, is shown in Table 36.

TABLE 36.—Commercial and municipal central electric stations—Average kilowatt capacity of dynamos, by kind, per station, and per machine: 1907 and 1902.

| KIND OF DYNAMO.                                 | TOTAL. |      | COMMERCIAL. |      | MUNICIPAL. |      |
|-------------------------------------------------|--------|------|-------------|------|------------|------|
|                                                 | 1907   | 1902 | 1907        | 1902 | 1907       | 1902 |
| Total kilowatt capacity:                        |        |      |             |      |            |      |
| Per station.....                                | 575    | 335  | 722         | 392  | 167        | 139  |
| Per machine.....                                | 223    | 97   | 256         | 103  | 87         | 62   |
| Direct-current, constant-voltage:               |        |      |             |      |            |      |
| Per station.....                                | 256    | 228  | 298         | 262  | 85         | 70   |
| Per machine.....                                | 110    | 86   | 120         | 92   | 52         | 42   |
| Direct-current, constant-amperage:              |        |      |             |      |            |      |
| Per station.....                                | 149    | 126  | 181         | 136  | 96         | 95   |
| Per machine.....                                | 48     | 41   | 50          | 40   | 44         | 48   |
| Alternating single-phase and polyphase current: |        |      |             |      |            |      |
| Per station.....                                | 645    | 280  | 816         | 323  | 177        | 120  |
| Per machine.....                                | 326    | 144  | 384         | 156  | 113        | 82   |

The average capacity of the several classes of dynamos, per station and per machine, was determined from the number of these machines as shown in Table 34, and the number of stations reporting the different types of dynamos is shown in the following statement:

Commercial and municipal central electric stations—Number of stations, by kind of dynamo: 1907 and 1902.

| KIND OF DYNAMO.                                 | Census. | Total. | Commercial. | Municipal. |
|-------------------------------------------------|---------|--------|-------------|------------|
| Direct-current, constant-voltage.....           | 1907    | 1,588  | 1,273       | 315        |
| Direct-current, constant-amperage.....          | 1902    | 1,447  | 1,195       | 252        |
| Direct-current, constant-amperage.....          | 1907    | 542    | 342         | 200        |
| Direct-current, constant-amperage.....          | 1902    | 1,160  | 864         | 296        |
| Alternating single-phase and polyphase current. | 1907    | 3,446  | 2,524       | 922        |
| Alternating single-phase and polyphase current. | 1902    | 2,634  | 2,069       | 565        |

The increase in the total average capacity of the dynamos per station and per machine, shown in Table 36, is in keeping with the general tendency toward larger units of equipment in almost all branches of central-station work.

For the direct-current dynamos there was an increase, although not very pronounced, both per station and per machine. The constant-amperage dynamos in the municipal stations form the single exception to an increase, the average capacity of these dynamos showing a decrease per machine from 48 to 44 kilo-



watts. There has been a large decrease in the number of this latter class of dynamos and probably but few new ones installed, and the figures indicate that those removed have been the machines of the larger capacity. In harmony with the great increase in the kilowatt capacity shown for the alternating-current dynamo in other tables, the table of average capacity shows an increase in every detail presented.

A better understanding of the dynamo equipment of central stations may be obtained from a study of the detailed statistics showing the number and capacity of the different types of machines, grouped according to size. The totals for the United States are summarized in Table 37.

TABLE 37.—Central electric stations—Kind of dynamos, by class, number, and kilowatt capacity: 1907.

| CLASS OF DYNAMO.                         | Total.    | Direct-current, constant-voltage. | Direct-current, constant-amperage. | Alternating single-phase and poly-phase current. |
|------------------------------------------|-----------|-----------------------------------|------------------------------------|--------------------------------------------------|
| Total:                                   |           |                                   |                                    |                                                  |
| Number.....                              | 12,173    | 3,680                             | 1,685                              | 6,808                                            |
| Kilowatt capacity.....                   | 2,709,225 | 406,460                           | 80,992                             | 2,221,773                                        |
| Under 200 kilowatt capacity:             |           |                                   |                                    |                                                  |
| Number.....                              | 9,491     | 3,128                             | 1,664                              | 4,699                                            |
| Kilowatt capacity.....                   | 664,440   | 183,865                           | 71,649                             | 408,926                                          |
| Per cent of total kilowatt capacity..... | 24.5      | 45.2                              | 88.5                               | 18.4                                             |
| 200 but under 500 kilowatt capacity:     |           |                                   |                                    |                                                  |
| Number.....                              | 1,547     | 417                               | 16                                 | 1,114                                            |
| Kilowatt capacity.....                   | 434,586   | 115,155                           | 4,833                              | 314,598                                          |
| Per cent of total kilowatt capacity..... | 16.0      | 28.3                              | 6.0                                | 14.2                                             |
| 500 but under 1,000 kilowatt capacity:   |           |                                   |                                    |                                                  |
| Number.....                              | 624       | 102                               | 3                                  | 519                                              |
| Kilowatt capacity.....                   | 390,149   | 63,890                            | 2,010                              | 324,249                                          |
| Per cent of total kilowatt capacity..... | 14.4      | 15.7                              | 2.5                                | 14.6                                             |
| 1,000 but under 2,000 kilowatt capacity: |           |                                   |                                    |                                                  |
| Number.....                              | 281       | 30                                | 2                                  | 249                                              |
| Kilowatt capacity.....                   | 351,700   | 36,550                            | 2,500                              | 312,650                                          |
| Per cent of total kilowatt capacity..... | 13.0      | 9.0                               | 3.1                                | 14.1                                             |
| 2,000 but under 5,000 kilowatt capacity: |           |                                   |                                    |                                                  |
| Number.....                              | 163       | 3                                 | .....                              | 160                                              |
| Kilowatt capacity.....                   | 438,350   | 7,000                             | .....                              | 431,350                                          |
| Per cent of total kilowatt capacity..... | 16.2      | 1.7                               | .....                              | 19.4                                             |
| 5,000 kilowatt capacity and over:        |           |                                   |                                    |                                                  |
| Number.....                              | 67        | .....                             | .....                              | 67                                               |
| Kilowatt capacity.....                   | 430,000   | .....                             | .....                              | 430,000                                          |
| Per cent of total kilowatt capacity..... | 15.9      | .....                             | .....                              | 19.4                                             |

Of the direct-current, constant-voltage dynamo capacity, 73.5 per cent was represented by the machines of less than 500 kilowatts; 24.7 per cent by those in the two classes 500 but under 2,000 kilowatt capacity; only 1.7 per cent by those in the class "2,000 but under 5,000 kilowatt capacity;" and none in the class "5,000 kilowatt capacity and over."

The direct-current, constant-amperage machines show even a larger proportion in the small classes, the class of "under 200 kilowatt capacity" having 88.5 per cent, with small proportions in the next three classes and no dynamo of this type of 2,000 kilowatt capacity or over.

The remarkable increase in the use of the alternating-current dynamo has already been shown, and its adaptability to the varying requirements as to capacity are demonstrated by the evenness of its distribution among the several classes, the variation in the propor-

tion of the six classes ranging from only 14.1 per cent for the class of the lowest total capacity to 19.4 for the class of the highest. Beginning with the class with the smallest kilowatt capacity, the proportions of the total capacity for all kinds of dynamos contributed by the alternating-current were as follows: 61.5; 72.4; 83.1; 88.9; 98.4; and 100 per cent, the proportion thus steadily increasing with the capacity of the dynamo.

In Table 38 the dynamos in commercial and municipal stations, respectively, have been grouped according to the capacity of the separate machines.

TABLE 38.—Commercial and municipal central electric stations—Dynamoes, by number and kilowatt capacity: 1907.

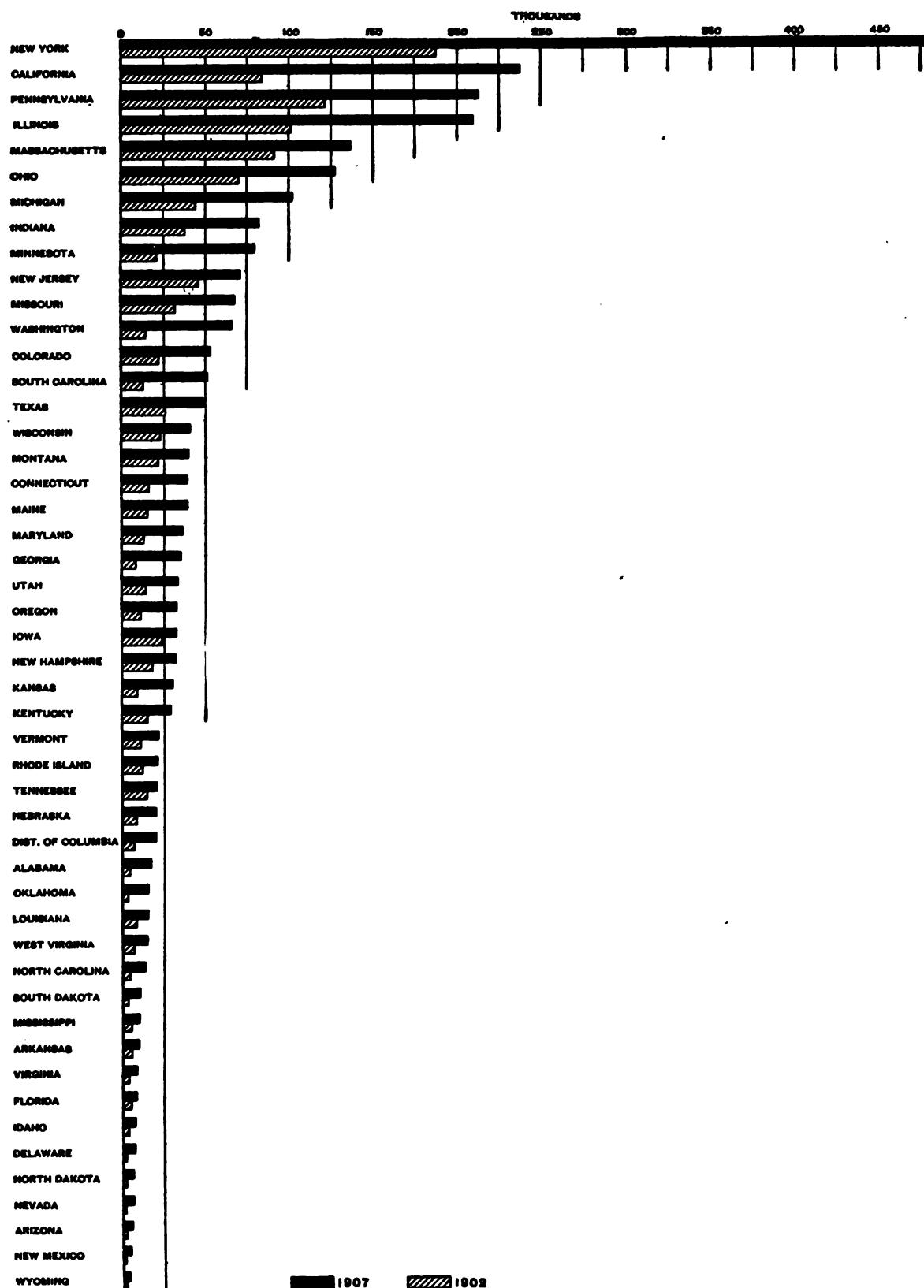
| CLASS OF DYNAMO.                         | Total.    | Commercial. | Municipal. |
|------------------------------------------|-----------|-------------|------------|
| Total:                                   |           |             |            |
| Number.....                              | 12,173    | 9,778       | 2,395      |
| Kilowatt capacity.....                   | 2,709,225 | 2,500,209   | 209,016    |
| Under 200 kilowatt capacity:             |           |             |            |
| Number.....                              | 9,491     | 7,283       | 2,208      |
| Kilowatt capacity.....                   | 664,440   | 513,427     | 151,013    |
| 200 but under 500 kilowatt capacity:     |           |             |            |
| Number.....                              | 1,547     | 1,375       | 172        |
| Kilowatt capacity.....                   | 434,586   | 389,833     | 44,753     |
| 500 but under 1,000 kilowatt capacity:   |           |             |            |
| Number.....                              | 624       | 613         | 11         |
| Kilowatt capacity.....                   | 390,149   | 383,699     | 6,450      |
| 1,000 but under 2,000 kilowatt capacity: |           |             |            |
| Number.....                              | 281       | 278         | 3          |
| Kilowatt capacity.....                   | 351,700   | 346,900     | 4,800      |
| 2,000 but under 5,000 kilowatt capacity: |           |             |            |
| Number.....                              | 163       | 162         | 1          |
| Kilowatt capacity.....                   | 438,350   | 436,350     | 2,000      |
| 5,000 kilowatt capacity and over:        |           |             |            |
| Number.....                              | 67        | 67          | .....      |
| Kilowatt capacity.....                   | 430,000   | 430,000     | .....      |

This table shows in every class not only the great preponderance of the dynamo capacity of commercial over municipal stations, but also the little use of dynamos of large capacity in the municipal stations.

The increase in dynamo capacity is practically confined to the states for which statistics are given in Table 39.

The total increase in the dynamo capacity of these 21 states, each of which made a gain of over 20,000 kilowatts, amounted to 1,256,929 kilowatts, or 84 per cent of the total increase for the entire United States. To illustrate the extent to which single-phase and poly-phase dynamos have superseded the other varieties of machines, the increase in their kilowatt capacity is shown separately and is found to approximate closely the total increase for all machines, the difference for the selected states being but 2,361 kilowatts, or less than two-tenths of 1 per cent, and that for the entire United States 11,521 kilowatts, or about eight-tenths of 1 per cent. In some states the increase in the capacity of the alternating-current machines exceeds that for all classes of dynamos; due to the fact that there was an actual decrease in the capacity of the direct-current machines in several states.

DIAGRAM 6.—CENTRAL ELECTRIC STATIONS—CAPACITY OF DYNAMOS, BY STATES, ARRANGED IN THE ORDER OF THEIR RELATIVE IMPORTANCE: 1907 AND 1902.



In each of 8 states—California, Illinois, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Washington—the increase in the capacity of dynamos exceeded 50,000 kilowatts. The total increase in these states amounted to 873,910, or 58.4 per cent of the

total gain for the United States. In 3 states—California, Illinois, and New York—the dynamo capacity increased more than 100,000 kilowatts each, the total amounting to 558,349 kilowatts, or 37.3 per cent of the total gain for all stations.

TABLE 39.—CENTRAL ELECTRIC STATIONS—KILOWATT CAPACITY OF DYNAMOS IN THE STATES WHICH INCREASED THEIR CAPACITY OVER 20,000 KILOWATTS: 1907 AND 1902.

| STATE.                         | KILOWATT CAPACITY. |           |                  |                       |                                    |                                                                                         |
|--------------------------------|--------------------|-----------|------------------|-----------------------|------------------------------------|-----------------------------------------------------------------------------------------|
|                                | Total.             |           | Actual increase. | Per cent of increase. | Per cent distribution of increase. | Actual increase in capacity of alternating single-phase and poly-phase current dynamos. |
|                                | 1907               | 1902      |                  |                       |                                    |                                                                                         |
| Total for United States.....   | 2,709,225          | 1,212,235 | 1,496,990        | 123.5                 | 100.0                              | 1,485,469                                                                               |
| Total for selected states..... | 2,238,059          | 981,120   | 1,256,929        | 128.1                 | 84.0                               | 1,254,568                                                                               |
| California.....                | 238,480            | 83,816    | 154,664          | 184.5                 | 10.3                               | 161,830                                                                                 |
| Colorado.....                  | 53,130             | 21,808    | 31,322           | 143.6                 | 2.1                                | 32,423                                                                                  |
| Connecticut.....               | 39,363             | 15,516    | 23,847           | 153.7                 | 1.6                                | 21,221                                                                                  |
| Georgia.....                   | 35,446             | 7,620     | 27,826           | 365.2                 | 1.9                                | 27,596                                                                                  |
| Illinois.....                  | 209,226            | 100,320   | 108,906          | 108.6                 | 7.3                                | 115,873                                                                                 |
| Indiana.....                   | 81,576             | 38,144    | 43,432           | 113.9                 | 2.9                                | 41,104                                                                                  |
| Kansas.....                    | 30,307             | 8,596     | 21,711           | 262.6                 | 1.5                                | 18,320                                                                                  |
| Maine.....                     | 39,290             | 15,291    | 23,999           | 156.9                 | 1.6                                | 22,158                                                                                  |
| Maryland.....                  | 36,223             | 13,207    | 23,016           | 174.3                 | 1.5                                | 24,106                                                                                  |
| Massachusetts.....             | 135,924            | 90,624    | 45,300           | 50.0                  | 3.0                                | 53,993                                                                                  |
| Michigan.....                  | 101,714            | 44,176    | 57,538           | 130.2                 | 3.8                                | 60,492                                                                                  |
| Minnesota.....                 | 78,516             | 20,999    | 57,517           | 273.9                 | 3.8                                | 52,496                                                                                  |
| Missouri.....                  | 68,467             | 32,100    | 36,367           | 113.3                 | 2.4                                | 39,318                                                                                  |
| New Jersey.....                | 70,566             | 46,120    | 24,446           | 53.0                  | 1.6                                | 20,316                                                                                  |
| New York.....                  | 482,031            | 187,252   | 294,779          | 157.4                 | 19.7                               | 295,359                                                                                 |
| Ohio.....                      | 126,533            | 69,811    | 56,722           | 81.3                  | 3.8                                | 58,050                                                                                  |
| Oregon.....                    | 32,587             | 11,165    | 21,422           | 191.9                 | 1.4                                | 19,325                                                                                  |
| Pennsylvania.....              | 212,543            | 121,388   | 91,155           | 75.1                  | 6.1                                | 82,198                                                                                  |
| South Carolina.....            | 51,271             | 13,390    | 37,881           | 282.9                 | 2.5                                | 38,370                                                                                  |
| Texas.....                     | 48,558             | 26,108    | 22,450           | 86.0                  | 1.5                                | 17,858                                                                                  |
| Washington.....                | 66,308             | 13,679    | 52,629           | 384.7                 | 3.5                                | 52,164                                                                                  |
| All other states.....          | 471,166            | 231,105   | 240,061          | 103.9                 | 16.0                               | 230,901                                                                                 |

In addition to the dynamos, the number and capacity of the auxiliary machines used in connection with the distribution of the electric energy were reported, and the statistics for them are summarized in Table 40.

TABLE 40.—Commercial and municipal central electric stations—Number and kilowatt capacity of miscellaneous main-station equipment: 1907 and 1902

| KIND OF EQUIPMENT.               | Cen-sus. | TOTAL.   |                      | COMMERCIAL. |                      | MUNICIPAL. |                      |
|----------------------------------|----------|----------|----------------------|-------------|----------------------|------------|----------------------|
|                                  |          | Num-ber. | Kilo-watt ca-pacity. | Num-ber.    | Kilo-watt ca-pacity. | Num-ber.   | Kilo-watt ca-pacity. |
| Transformers <sup>1</sup> .....  | 1907     | 1,577    | 592,708              | 1,432       | 587,421              | 145        | 5,287                |
| Rotaries.....                    | 1907     | 180      | 52,416               | 175         | 51,703               | 5          | 713                  |
|                                  | 1902     | 132      | 47,608               | 131         | 47,508               | 1          | 100                  |
| Boosters.....                    | 1907     | 127      | 4,810                | 106         | 4,474                | 21         | 336                  |
|                                  | 1902     | 193      | 13,361               | 184         | 13,230               | 9          | 131                  |
| Storage-battery cells....        | 1907     | 9,751    | .....                | 9,255       | .....                | 496        | .....                |
|                                  | 1902     | 6,881    | .....                | 5,981       | .....                | 900        | .....                |
| Miscellaneous <sup>2</sup> ..... | 1907     | .....    | 43,209               | .....       | 42,256               | .....      | 953                  |

<sup>1</sup> Not reported as main-station equipment in 1902.

<sup>2</sup> Includes motor generators, motors, regulators, and other accessories. Not reported as main-station equipment in 1902.

The transformers in the main station, which are chiefly those used to raise the voltage generated for purposes of transmission, and miscellaneous machines were not called for in 1902 as connected with the generating plant; hence the extent of their use at

that census can not be determined. The transformers probably were reliably reported, but it was apparent from an examination of the reports that there was little uniformity among the electric companies in reporting their miscellaneous machines. The commercial stations, which reported most of the boosters, show a decided decrease in these machines in 1907, which is in harmony with the later dynamo equipment and more recent methods followed in central-station management.

The substation equipment, as reported at the two censuses, is shown in Table 41.

TABLE 41.—Commercial and municipal central electric stations—Number and kilowatt capacity of substation equipment, by kind: 1907 and 1902.

| KIND OF EQUIPMENT.               | Cen-sus. | TOTAL.   |                    | COMMERCIAL. |                    | MUNICIPAL. |                    |
|----------------------------------|----------|----------|--------------------|-------------|--------------------|------------|--------------------|
|                                  |          | Num-ber. | Kilowatt capacity. | Num-ber.    | Kilowatt capacity. | Num-ber.   | Kilowatt capacity. |
| Transformers.....                | 1907     | 4,211    | 1,100,824          | 4,047       | 1,090,261          | 164        | 10,563             |
|                                  | 1902     | 1,800    | 312,848            | 1,765       | 311,879            | 35         | 969                |
| Rotaries.....                    | 1907     | 490      | 311,003            | 490         | 311,003            | .....      | .....              |
|                                  | 1902     | 169      | 81,728             | 168         | 81,721             | 1          | 7                  |
| Storage-battery cells....        | 1907     | 20,187   | .....              | 20,187      | .....              | .....      | .....              |
|                                  | 1902     | 8,388    | .....              | 8,388       | .....              | .....      | .....              |
| Miscellaneous <sup>1</sup> ..... | 1907     | .....    | 99,275             | .....       | 98,117             | .....      | 1,158              |
|                                  | 1902     | .....    | 15,997             | .....       | 15,867             | .....      | 130                |

<sup>1</sup> Includes motor generators, motors, regulators, and other accessories.

It is evident that the electric service performed by the municipal stations was of a character which necessitated a very limited use of substations. Of the 1,093 substations reported for all central stations, only 57 were connected with municipal stations, and practically their entire equipment was confined to a few step-down transformers.

#### OUTPUT OF STATIONS.

The product of central electric stations is electrical energy or current and the operations of such stations are measured by this output in kilowatt hours. Accordingly, as in 1902, an inquiry with respect to the total output of current for the year in kilowatt hours was made a part of the schedule. With many establishments, the output is a matter of scientific accounting, being carefully recorded from the actual watt-hour or kilowatt-hour readings of dynamo meters. Many other establishments, however, particularly the smaller plants, could give no exact data in reply to this inquiry, but were asked to make careful estimates. There is thus a considerable element of estimate in the figures, but it is believed that it is not sufficiently large to vitiate or to impair seriously their statistical value.

TABLE 42.—Central electric stations and electric railways—Output of generating stations: 1907 and 1902.

|                        | KILOWATT HOURS. |               | Per cent of increase. |
|------------------------|-----------------|---------------|-----------------------|
|                        | 1907            | 1902          |                       |
| Total.....             | 10,621,406,837  | 4,768,535,512 | 122.7                 |
| Central stations.....  | 5,862,276,737   | 2,507,051,115 | 133.8                 |
| Electric railways..... | 4,759,130,100   | 2,261,484,397 | 110.4                 |

There were 10,621,406,837 kilowatt hours of current generated in central stations and electric-railway plants in 1907 compared with 4,768,535,512 in 1902, an increase of 122.7 per cent. Central stations reported 55.2 per cent of the total output in 1907 as compared with 52.6 per cent in 1902.

It is interesting to compare the total kilowatt capacity of dynamos with the annual output of current. Confining this comparison to central stations, the total kilowatt-hour capacity of such stations in 1907 was reported as 2,709,225, and the annual output was 5,862,276,737 kilowatt hours. Assuming that the stations could be operated continuously twenty-four hours a day for 365 days, or one year, at their maximum capacity, the theoretical annual capacity would be 23,732,811,000 kilowatt hours; the actual output, however, was only 24.7 per cent, or less than one-fourth, of this amount. The corresponding percentage at the census of 1902 was 23.6. As illustrating the same point, a division of the kilowatt capacity of the dynamos into the output for the year gives, theoretically, the number of hours of operation of the generators on the basis of their maximum capacity.

The figures, thus derived, 2,164 for 1907 and 2,068 for 1902, when compared with the total number of hours in a year of 365 days, 8,760, show in another way the difference between the theoretical maximum capacity and the actual conditions as reported. There are, however, several circumstances which lessen the value of such comparisons. The indicated capacity of a dynamo is the theoretical maximum capacity or greatest load at which it can be operated. It is mechanically impossible, of course, to operate dynamos or other machinery at maximum capacity for any length of time, and the necessity for repairs frequently puts the generating machinery wholly out of commission. Many central stations, especially those of large capacity, have installed duplicate machines to provide against accident, and thus throughout the year a considerable part of their equipment is idle. Again, to render satisfactory service to the consumers, a station should be equipped to transmit sufficient current to satisfy the largest possible demand. Therefore as the consumption varies from the peak of the load capacity to a small fraction of it the speed of the dynamos is moderated, or some of them are stopped altogether, in accordance with the requirements. A large proportion of the smaller plants operate only during the hours of darkness, and many during the few hours from sunset to midnight. These and other factors, therefore, combine to explain the difference, previously noted, between the actual output of the central-station dynamos and the output which they are theoretically capable of generating.

The income received during the year 1907 by central stations from the sale of current amounted to \$169,614,691; the total output of stations was 5,862,276,737 kilowatt hours; the average earnings per kilowatt hour therefore appear to have been about  $2\frac{9}{10}$  cents, compared with  $3\frac{1}{10}$  cents in 1902. Improved methods of transmission in 1907 over 1902, resulting in a decreased loss of current, the large increase in the average capacity of the generating units, and economies in other directions, have no doubt reduced the cost of production and thus make possible the delivery of current at a lower figure.

A comparison of the output of commercial and municipal stations reveals the comparative unimportance of the latter in that respect.

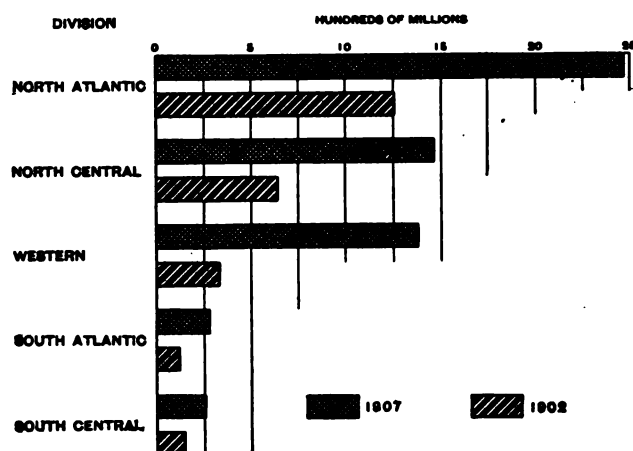
TABLE 43.—Commercial and municipal central electric stations—Output of generating stations: 1907 and 1902.

|                 | KILOWATT HOURS. |               | Per cent of increase. |
|-----------------|-----------------|---------------|-----------------------|
|                 | 1907            | 1902          |                       |
| Total.....      | 5,862,276,737   | 2,507,051,115 | 133.8                 |
| Commercial..... | 5,572,813,949   | 2,311,146,676 | 141.1                 |
| Municipal.....  | 289,462,788     | 195,904,439   | 47.8                  |

From 1902 to 1907 the output of municipal stations increased only 47.8 per cent, while the output of commercial stations increased 141.1 per cent. The greater importance of commercial stations is still further shown in the fact that the percentage which their output formed of the total for all central stations increased from 92.2 in 1902 to 95.1 in 1907, while as a necessary sequence the proportion of municipal stations dropped from 7.8 per cent to 4.9 per cent.

The increase in output of electric current is an accurate measure of the increase in importance of the central stations in other particulars—investment, equipment, etc. The accompanying diagram shows the output for each geographic division for 1907 and 1902.

DIAGRAM 7.—Central electric stations—Output, by geographic divisions: 1907 and 1902.



The following table illustrates the differences which mark the rate of development of the use of electric current for light and power in the several states. The output in every state shows an increase in 1907 over 1902. The largest actual increase is shown for New York, with California, Illinois, Washington, Pennsylvania, Michigan, and Montana following in the order named, each with an increase of more than 100,000,000 kilowatt hours. On the other hand the states which

show the largest percentages of increase are Nevada, Washington, Oklahoma, Georgia, Oregon, Kansas, and California, in the order given, each with an increase exceeding 300 per cent. The smallest increase in both amount and per cent was for Iowa.

TABLE 44.—Central electric stations—Output of generating stations, by states and territories, with per cent of increase and per cent distribution of total increase: 1907 and 1902.

| STATE OR TERRITORY.                    | OUTPUT OF STATIONS (KILOWATT HOURS). |               |                  |                       |                                    |
|----------------------------------------|--------------------------------------|---------------|------------------|-----------------------|------------------------------------|
|                                        | 1907                                 | 1902          | Actual increase. | Per cent of increase. | Per cent distribution of increase. |
| United States.....                     | 5,862,276,737                        | 2,507,061,115 | 3,355,225,622    | 133.8                 | 100.0                              |
| Alabama.....                           | 30,846,764                           | 11,616,707    | 19,230,057       | 165.5                 | 0.6                                |
| Arizona.....                           | 9,392,302                            | 3,662,045     | 5,730,257        | 156.5                 | 0.2                                |
| Arkansas.....                          | 11,519,316                           | 9,965,997     | 1,553,319        | 15.6                  | ( <sup>1</sup> )                   |
| California.....                        | 661,606,309                          | 152,728,042   | 508,878,267      | 333.2                 | 15.2                               |
| Colorado.....                          | 123,275,212                          | 60,177,084    | 63,098,128       | 104.9                 | 1.9                                |
| Connecticut.....                       | 67,406,232                           | 26,738,121    | 40,668,111       | 152.1                 | 1.2                                |
| Delaware and District of Columbia..... | 30,543,522                           | 17,871,872    | 12,671,650       | 70.9                  | 0.4                                |
| Florida.....                           | 11,765,984                           | 8,066,078     | 3,699,916        | 45.9                  | 0.1                                |
| Georgia.....                           | 59,311,302                           | 9,911,243     | 49,399,959       | 498.4                 | 1.5                                |
| Idaho.....                             | 9,577,588                            | 5,018,149     | 4,559,439        | 90.9                  | 0.1                                |
| Illinois.....                          | 467,657,328                          | 161,543,046   | 306,113,682      | 189.5                 | 9.1                                |
| Indiana.....                           | 130,263,663                          | 75,385,493    | 54,878,170       | 72.3                  | 1.6                                |
| Iowa.....                              | 37,729,072                           | 36,506,425    | 1,222,647        | 3.3                   | ( <sup>1</sup> )                   |
| Kansas.....                            | 59,740,179                           | 13,326,518    | 46,413,661       | 348.3                 | 1.4                                |
| Kentucky.....                          | 37,232,623                           | 27,835,614    | 9,397,009        | 33.8                  | 0.3                                |
| Louisiana.....                         | 26,421,316                           | 17,474,261    | 8,947,055        | 51.2                  | 0.3                                |
| Maine.....                             | 66,136,651                           | 21,987,700    | 44,148,951       | 200.8                 | 1.3                                |
| Maryland.....                          | 47,868,675                           | 22,128,125    | 25,740,550       | 116.3                 | 0.8                                |
| Massachusetts.....                     | 219,425,669                          | 125,813,362   | 93,612,315       | 74.4                  | 2.8                                |
| Michigan.....                          | 208,154,199                          | 80,564,630    | 127,589,569      | 158.4                 | 3.8                                |
| Minnesota.....                         | 87,579,431                           | 40,258,632    | 47,320,799       | 117.5                 | 1.4                                |
| Mississippi.....                       | 15,704,624                           | 9,825,626     | 5,878,998        | 59.8                  | 0.2                                |
| Missouri.....                          | 147,328,446                          | 57,450,731    | 89,877,715       | 156.4                 | 2.7                                |
| Montana.....                           | 137,379,261                          | 36,435,766    | 100,943,495      | 277.0                 | 0.6                                |
| Nebraska.....                          | 31,958,739                           | 12,315,775    | 19,642,964       | 159.5                 | 0.6                                |
| Nevada.....                            | 29,621,730                           | 1,508,910     | 28,112,820       | 1,863.1               | 0.8                                |
| New Hampshire.....                     | 55,258,921                           | 27,377,793    | 27,881,128       | 101.8                 | 0.8                                |
| New Jersey.....                        | 140,527,322                          | 78,739,456    | 61,788,066       | 78.5                  | 1.8                                |
| New Mexico.....                        | 4,614,349                            | 2,637,810     | 1,976,539        | 74.9                  | 0.1                                |
| New York.....                          | 1,452,222,471                        | 701,769,716   | 750,452,755      | 106.9                 | 22.4                               |
| North Carolina.....                    | 13,171,681                           | 8,351,346     | 4,820,335        | 57.7                  | 0.1                                |
| North Dakota.....                      | 8,229,765                            | 5,850,115     | 2,379,650        | 40.7                  | 0.1                                |
| Ohio.....                              | 217,311,924                          | 127,437,383   | 89,874,541       | 70.5                  | 2.7                                |
| Oklahoma.....                          | 24,985,903                           | 3,825,763     | 21,160,140       | 553.1                 | 0.6                                |
| Oregon.....                            | 92,807,992                           | 17,531,660    | 75,276,332       | 429.4                 | 2.2                                |
| Pennsylvania.....                      | 416,554,167                          | 241,094,328   | 175,459,839      | 72.8                  | 5.2                                |
| Rhode Island.....                      | 35,651,323                           | 23,436,435    | 12,214,888       | 52.1                  | 0.4                                |
| South Carolina.....                    | 68,696,424                           | 18,426,763    | 50,269,661       | 272.8                 | 1.5                                |
| South Dakota.....                      | 13,615,015                           | 4,256,007     | 9,359,008        | 219.9                 | 0.3                                |
| Tennessee.....                         | 34,847,956                           | 24,472,632    | 10,375,324       | 42.4                  | 0.3                                |
| Texas.....                             | 75,829,108                           | 48,888,450    | 26,940,658       | 55.1                  | 0.8                                |
| Utah.....                              | 61,672,661                           | 32,457,063    | 29,215,598       | 90.0                  | 0.9                                |
| Vermont.....                           | 29,923,333                           | 22,374,060    | 7,549,273        | 33.7                  | 0.2                                |
| Virginia.....                          | 10,208,960                           | 6,879,243     | 3,329,717        | 48.4                  | 0.1                                |
| Washington.....                        | 257,785,236                          | 19,722,382    | 238,062,854      | 1,207.1               | 7.1                                |
| West Virginia.....                     | 24,871,317                           | 11,355,905    | 13,515,412       | 119.0                 | 0.4                                |
| Wisconsin.....                         | 52,546,210                           | 29,966,758    | 22,579,452       | 75.3                  | 0.7                                |
| Wyoming.....                           | 5,499,084                            | 3,883,285     | 1,615,799        | 41.6                  | ( <sup>1</sup> )                   |

<sup>1</sup> Less than one-tenth of 1 per cent.

## CHAPTER IV.

### LINE EQUIPMENT.

*Central stations and electric railways.*—The prevalence of the lighting and general motor service among the electric-railway companies makes it necessary to combine their equipment with that of the central stations

in order to show the total number of lamps, meters, transformers, and stationary motors wired for service. Such totals are given in Table 45.

**TABLE 45.—CENTRAL ELECTRIC STATIONS AND ELECTRIC RAILWAYS—LAMPS, METERS, TRANSFORMERS IN CIRCUITS, AND STATIONARY MOTORS: 1907 AND 1902.**

|                                                                                | TOTAL.     |                  | CENTRAL STATIONS. |                  | ELECTRIC RAILWAYS. |                  | PER CENT OF INCREASE. |                   |                    |
|--------------------------------------------------------------------------------|------------|------------------|-------------------|------------------|--------------------|------------------|-----------------------|-------------------|--------------------|
|                                                                                | 1907       | 1902             | 1907              | 1902             | 1907               | 1902             | Total.                | Central stations. | Electric railways. |
| Arc lamps.....                                                                 | 635,815    | 419,561          | 555,713           | 385,696          | 80,102             | 33,863           | 51.5                  | 44.1              | 136.5              |
| Public.....                                                                    | 318,819    | 229,403          | 289,391           | 211,725          | 29,428             | 17,678           | 39.0                  | 36.7              | 66.5               |
| Commercial.....                                                                | 316,996    | 190,158          | 266,322           | 173,973          | 50,674             | 16,185           | 66.7                  | 53.1              | 213.1              |
| Incandescent lamps.....                                                        | 45,991,836 | 19,636,729       | 41,445,997        | 18,194,044       | 4,545,839          | 1,442,685        | 134.2                 | 127.8             | 215.1              |
| Public.....                                                                    | 866,851    | 474,686          | 808,693           | 455,660          | 58,158             | 19,026           | 82.6                  | 77.5              | 205.7              |
| Commercial.....                                                                | 45,124,985 | 19,162,043       | 40,637,304        | 17,738,384       | 4,487,681          | 1,423,659        | 135.5                 | 129.1             | 215.2              |
| Other varieties of lamps—Nernst, vacuum, vapor, etc.....                       | 190,979    | ( <sup>1</sup> ) | 162,338           | ( <sup>1</sup> ) | 28,641             | ( <sup>1</sup> ) | .....                 | .....             | .....              |
| Public.....                                                                    | 6,090      | ( <sup>1</sup> ) | 5,716             | ( <sup>1</sup> ) | 374                | ( <sup>1</sup> ) | .....                 | .....             | .....              |
| Commercial.....                                                                | 184,889    | ( <sup>1</sup> ) | 156,622           | ( <sup>1</sup> ) | 28,267             | ( <sup>1</sup> ) | .....                 | .....             | .....              |
| Lamps used by the central stations to light their own electric properties..... | 1,107,116  | ( <sup>1</sup> ) | 275,079           | ( <sup>1</sup> ) | 832,037            | ( <sup>1</sup> ) | .....                 | .....             | .....              |
| Meters on consumption circuits.....                                            | 1,897,803  | 639,290          | 1,683,917         | 582,689          | 213,886            | 56,601           | 196.9                 | 189.0             | 277.9              |
| Transformers in circuits for customers:                                        |            |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....                                                                    | 299,489    | 207,370          | 299,489           | 207,370          | ( <sup>2</sup> )   | ( <sup>2</sup> ) | 44.4                  | 44.4              | .....              |
| Kilowatt capacity.....                                                         | 2,058,567  | 687,121          | 2,058,567         | 687,121          | ( <sup>2</sup> )   | ( <sup>2</sup> ) | 199.6                 | 199.6             | .....              |
| Stationary motors: <sup>3</sup>                                                |            |                  |                   |                  |                    |                  |                       |                   |                    |
| Number.....                                                                    | 187,652    | 111,113          | 167,184           | 101,064          | 20,468             | 10,049           | 68.9                  | 65.4              | 103.7              |
| Horsepower.....                                                                | 1,807,949  | 473,693          | 1,649,026         | 438,006          | 158,923            | 35,688           | 281.7                 | 276.5             | 345.3              |

<sup>1</sup> Not reported separately.

<sup>2</sup> Not called for in schedule for electric railways.

<sup>3</sup> Some fan motors were included in 1902, but such motors were omitted in 1907.

The apparatus represented by the statistics in this table is characteristic of central-station work, and although a considerable proportion is connected with railway plants, it all belongs to the same department of industry. For the two branches of service together an aggregate of 47,925,746 lamps is shown for 1907 as compared with 20,056,290 for 1902, the increase amounting to 27,869,456, or 139 per cent. Of the total number of lamps, the central stations reported 88.6 per cent in 1907 and 92.6 per cent in 1902, and the electric railways, 11.4 per cent in 1907 and 7.4 per cent in 1902. In 1902 the railways reported 8.1 per cent of the arc lamps and 7.3 per cent of the incandescent lamps; at the census of 1907 these proportions had increased to 12.6 and 9.9 per cent, respectively.

Large increases are shown for all of the items of equipment, and in every instance the percentage of increase was much larger for the electric-railway plants than for the central stations. Several causes contribute to this condition, among which may be mentioned the method of preparing the reports when a central station and electric-railway plant are united and keep only one system of accounts. The tendency toward such combination in the interest of economy has been very general, and when separate reports

for the two branches could not be furnished, the combined industry was returned as an electric railway rather than as a central station, irrespective of the relative importance of the two branches.

The electric-railway branch of the characteristic central-station industry is, however, of very minor importance, comparatively, and the large percentages of increase in its apparatus have little effect on the increases shown for the total apparatus used in furnishing electric light and power.

#### CENTRAL STATIONS.

*Lamps, meters, transformers, and stationary motors.*—The lamps used for lighting streets, parks, public buildings, and all other public places for the illumination of which the municipality or other local government was responsible, were considered as devoted to the "public service," and were reported separately from those used in general "commercial service" in lighting residences, places of business, etc., for which individuals or private enterprises were responsible. The number of lamps for these two branches of service are shown in Table 46, which presents also data concerning the meters, transformers, and motors.

# LINE EQUIPMENT.

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TABLE 46.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—LAMPS, METERS, TRANSFORMERS IN CIRCUITS, AND STATIONARY MOTORS: 1907 AND 1902.

|                                                                                | TOTAL.     |            | COMMERCIAL. |            | MUNICIPAL. |           | PER CENT OF INCREASE. |                  |            |
|--------------------------------------------------------------------------------|------------|------------|-------------|------------|------------|-----------|-----------------------|------------------|------------|
|                                                                                | 1907       | 1902       | 1907        | 1902       | 1907       | 1902      | Total.                | Commer-<br>cial. | Municipal. |
| Arc lamps.....                                                                 | 555,713    | 385,698    | 472,773     | 334,903    | 82,940     | 50,795    | 44.1                  | 41.2             | 63.3       |
| Public.....                                                                    | 289,391    | 211,725    | 216,309     | 166,723    | 73,082     | 45,002    | 36.7                  | 29.7             | 62.4       |
| Commercial.....                                                                | 266,322    | 173,973    | 256,464     | 168,180    | 9,858      | 5,793     | 53.1                  | 52.5             | 70.2       |
| Incandescent lamps.....                                                        | 41,445,997 | 18,194,044 | 37,393,549  | 16,616,593 | 4,052,448  | 1,577,451 | 127.8                 | 125.0            | 158.9      |
| Public.....                                                                    | 808,693    | 455,660    | 638,456     | 372,740    | 170,237    | 82,920    | 77.5                  | 71.3             | 105.3      |
| Commercial.....                                                                | 40,637,304 | 17,738,384 | 36,755,093  | 16,243,853 | 3,882,211  | 1,494,531 | 129.1                 | 126.3            | 159.8      |
| Other varieties of lamps—Nernst, vacuum, vapor, etc.....                       | 162,338    | (1)        | 153,468     | (1)        | 8,870      | (1)       |                       |                  |            |
| Public.....                                                                    | 5,716      | (1)        | 4,584       | (1)        | 1,132      | (1)       |                       |                  |            |
| Commercial.....                                                                | 156,622    | (1)        | 148,884     | (1)        | 7,738      | (1)       |                       |                  |            |
| Lamps used by the central stations to light their own electric properties..... | 275,079    | (1)        | 245,905     | (1)        | 29,174     | (1)       |                       |                  |            |
| Arc.....                                                                       | 7,082      | (1)        | 6,487       | (1)        | 596        | (1)       |                       |                  |            |
| Incandescent.....                                                              | 268,242    | (1)        | 237,729     | (1)        | 28,513     | (1)       |                       |                  |            |
| All other lamps.....                                                           | 1,755      | (1)        | 1,689       | (1)        | 66         | (1)       |                       |                  |            |
| Meters on consumption circuits.....                                            | 1,683,917  | 582,689    | 1,468,763   | 526,011    | 215,154    | 56,678    | 189.0                 | 179.2            | 279.6      |
| Transformers in circuits for customers:                                        |            |            |             |            |            |           |                       |                  |            |
| Number.....                                                                    | 299,489    | 207,370    | 255,337     | 179,300    | 44,152     | 28,070    | 44.4                  | 42.4             | 57.3       |
| Kilowatt capacity.....                                                         | 2,058,567  | 687,121    | 1,897,170   | 612,442    | 161,397    | 74,679    | 199.6                 | 209.8            | 116.1      |
| Stationary motors: <sup>1</sup>                                                |            |            |             |            |            |           |                       |                  |            |
| Number.....                                                                    | 167,184    | 101,064    | 162,677     | 99,102     | 4,507      | 1,962     | 65.4                  | 64.2             | 129.7      |
| Horsepower.....                                                                | 1,649,026  | 438,005    | 1,617,337   | 434,681    | 31,689     | 3,324     | 276.5                 | 272.1            | 853.3      |

<sup>1</sup> Not reported separately.

<sup>2</sup> Some fan motors were included in 1902, but such motors were omitted in 1907.

Although every item of equipment specified in the table shows a large increase in 1907 as compared with 1902, the most notable increases and those indicating most nearly the progress in the industry are those for incandescent lamps, stationary motors, meters on consumption circuits, and transformers in circuits for customers. The number of incandescent lamps is necessarily, to some extent, an estimate. Accepting these estimates, there were 42,439,127 lamps of all varieties

connected with the central stations at the close of 1907 and 18,579,742 at the close of 1902, the increase for the five years amounting to 23,859,385 lamps, or 128.4 per cent. While this increase in the aggregate number of lamps indicates the development, a clearer understanding of the conditions will be obtained by an analysis of the statistics for the different varieties. *Arc lamps.*—The statistics for the arc lamps are shown in Table 47.

TABLE 47.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—ARC LAMPS, BY KINDS: 1907 AND 1902.

| KIND.                    | TOTAL.    |         | COMMERCIAL. |         | MUNICIPAL. |        | PER CENT OF INCREASE. |                  |            |
|--------------------------|-----------|---------|-------------|---------|------------|--------|-----------------------|------------------|------------|
|                          | 1907      | 1902    | 1907        | 1902    | 1907       | 1902   | Total.                | Commer-<br>cial. | Municipal. |
| Total.....               | 1,555,713 | 385,698 | 472,773     | 334,903 | 82,940     | 50,795 | 44.1                  | 41.2             | 63.3       |
| Open arcs.....           | 78,886    | 181,672 | 60,456      | 149,704 | 18,430     | 31,968 | 156.6                 | 159.6            | 142.3      |
| Public.....              | 66,879    | 138,684 | 48,875      | 108,082 | 18,004     | 30,602 | 151.8                 | 154.8            | 141.2      |
| Direct-current.....      | 64,416    | 134,054 | 47,207      | 106,401 | 17,209     | 28,653 | 151.9                 | 155.2            | 139.9      |
| Alternating-current..... | 2,463     | 4,630   | 1,668       | 2,681   | 795        | 1,949  | 146.8                 | 137.8            | 159.2      |
| Commercial.....          | 12,007    | 42,988  | 11,581      | 41,622  | 426        | 1,366  | 172.1                 | 172.2            | 168.8      |
| Direct-current.....      | 10,060    | 39,255  | 9,696       | 37,991  | 354        | 1,264  | 174.4                 | 174.5            | 172.0      |
| Alternating-current..... | 1,947     | 3,733   | 1,885       | 3,631   | 72         | 1,102  | 147.6                 | 148.1            | 129.4      |
| Inclosed arcs.....       | 476,827   | 204,026 | 412,317     | 185,199 | 64,510     | 18,827 | 133.7                 | 122.6            | 242.6      |
| Public.....              | 222,512   | 73,041  | 167,434     | 58,641  | 55,078     | 14,400 | 204.6                 | 185.5            | 282.5      |
| Direct-current.....      | 68,500    | 29,608  | 54,066      | 23,006  | 14,434     | 6,602  | 131.4                 | 135.0            | 118.6      |
| Alternating-current..... | 154,012   | 43,433  | 113,368     | 35,635  | 40,644     | 7,798  | 254.6                 | 218.1            | 421.2      |
| Commercial.....          | 254,315   | 130,985 | 244,883     | 126,558 | 9,432      | 4,427  | 94.2                  | 93.5             | 113.1      |
| Direct-current.....      | 126,251   | 67,180  | 125,150     | 66,104  | 1,101      | 1,076  | 87.9                  | 89.3             | 2.3        |
| Alternating-current..... | 128,064   | 63,805  | 119,733     | 60,454  | 8,331      | 3,351  | 100.7                 | 98.1             | 148.6      |

<sup>1</sup> Exclusive of 7,082 lamps used by the central stations to light their own electric properties.

<sup>2</sup> Decrease.

Notwithstanding a considerable increase in the total number of arc lamps—170,015, or 44.1 per cent—the gain has been at a slower rate than that for incandescent lamps. At the census of 1902 the arc lamp had reached a higher degree of development than the incandescent lamp, since in the early stages of the industry

the demand for electricity was to a considerable extent influenced by its utility for street lighting, a branch of service which was at first confined to arc lamps. Now, however, the incandescent lamp has largely superseded the arc lamp for street and other lighting purposes, since it has been found that better service is secured

by the distribution of a larger number of comparatively small lamps than by the use of a few lamps of large candlepower. In fact, the relatively small gain in arc lamps may be accounted for by the much greater general usefulness of the incandescent lamp. The percentage of increase in the number of arc lamps was somewhat larger for the municipal than for the commercial stations. Inasmuch, however, as the total number of these lamps in municipal stations formed less than one-seventh of the total number in both branches of the service in 1902, and but little more than one-seventh in 1907, the percentage of gain is not of so much real significance. In this connection it may be of interest to note that, although at both censuses the municipal stations had a larger proportion of the total number of arc lamps than of the total number of incandescent lamps, the percentages being 14.9 for the former class and 9.8 for the latter in 1907, and 13.2 and 8.7 for the two classes, respectively, in 1902, the gains in the percentages were remarkably close, being 1.7 for the arc lamps and 1.1 for the incandescent lamps.

Since the census of 1902 the change then going on from the open arc to the inclosed has continued on a large scale. At that census the open-arc lamps which were of very limited length of continuous burning represented 47.1 per cent of the total number of

arcs, but in 1907 the proportion had declined to 14.2 per cent. There was an actual decrease in the number of open-arc lamps of 102,786, or 56.6 per cent, and an increase in the number of inclosed-arc lamps of 272,801, or 133.7 per cent. These figures show conclusively that not only is the inclosed arc demanded in new work, but that the old equipment of open arcs has largely been replaced by the inclosed lamp. In 1902 of the open arcs reported 82.4 per cent were in commercial stations and 17.6 per cent in municipal stations, while the corresponding proportions for 1907 were 76.6 per cent and 23.4 per cent, respectively. The following tabular statement shows the per cent distribution, by kind, of arc lamps, for commercial and municipal stations, for the years 1907 and 1902:

*Commercial and municipal central electric stations—Per cent distribution of arc lamps, by kind: 1907 and 1902.*

| KIND.         | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|---------------|--------|-------|-------------|-------|------------|-------|
|               | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total.....    | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Open.....     | 14.2   | 47.1  | 12.8        | 44.7  | 22.2       | 62.9  |
| Inclosed..... | 85.8   | 52.9  | 87.2        | 55.3  | 77.8       | 37.1  |

The change from open to inclosed arc lamps has been accompanied by a decided change in the kind of current used in operating them.

TABLE 48.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—ARC LAMPS, BY KIND OF CURRENT USED: 1907 AND 1902.

| KIND.                    | TOTAL.    |         | COMMERCIAL. |         | MUNICIPAL. |        | PER CENT OF INCREASE. |             |            |
|--------------------------|-----------|---------|-------------|---------|------------|--------|-----------------------|-------------|------------|
|                          | 1907      | 1902    | 1907        | 1902    | 1907       | 1902   | Total.                | Commercial. | Municipal. |
| Total.....               | 1,555,713 | 385,698 | 472,773     | 334,903 | 82,940     | 50,795 | 44.1                  | 41.2        | 63.3       |
| Direct current.....      | 269,217   | 270,097 | 236,119     | 232,502 | 33,098     | 37,595 | +0.3                  | 1.6         | +12.0      |
| Alternating current..... | 286,496   | 115,601 | 236,654     | 102,401 | 49,842     | 13,200 | 147.8                 | 131.1       | 277.6      |

<sup>1</sup> Exclusive of 7,082 lamps used by central stations to light their own properties.

<sup>2</sup> Decrease.

Of the total number of arc lamps in 1902, seven-tenths were direct-current, but in 1907 the corresponding proportion was less than one-half. The increase of 170,015 arc lamps between 1902 and 1907 is due wholly to the gain in the alternating-current lamps, since there was an actual loss of 880 in the number of those operated by direct current. The change in the character of current used has taken place somewhat more rapidly in municipal than in commercial stations.

TABLE 49.—Commercial and municipal central electric stations—Per cent distribution of arc lamps, by kind of current used: 1907 and 1902.

| KIND.                    | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|--------------------------|--------|-------|-------------|-------|------------|-------|
|                          | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total.....               | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Direct current.....      | 48.4   | 70.0  | 49.9        | 69.4  | 39.9       | 74.0  |
| Alternating current..... | 51.6   | 30.0  | 50.1        | 30.6  | 60.1       | 26.0  |

*Incandescent lamps.*—The incandescent lamps have become an important adjunct to business, and in some of its uses may be rightfully classed as necessary to comfort, although in other cases its use is a luxury. Spectacular and beautiful effects are produced with incandescent lamps in outdoor and indoor illumination, while electric signs in motion effects and in colors, and window and store decorations of great brilliancy are now common in all large centers. These features have become so important in central-station work that a special department devoted to this branch of the service is considered necessary by many of the larger companies. The developments along the lines of incandescent lighting have been wonderful and the possibilities seem almost limitless.

Various kinds of lamps which in 1902 were in a semiexperimental stage have since become of demonstrated merit, while new ones are continually being invented. In fact, so numerous and so desirable were many of these lamps that at the census of 1907 it was



decided to add an inquiry calling for the number of such lamps, and, although it is probable that some lamps of these classes were erroneously reported as incandescent lamps, 162,338 lamps of the special varieties were reported separately by the various central

stations. In 1902 these types of lamps were probably included in the total number of incandescent lamps reported, and consequently their actual increase as given in Table 50 is less than it should be.

TABLE 50.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—INCANDESCENT LAMPS, BY CANDLE-POWER, AND OTHER VARIETIES OF LAMPS: 1907 AND 1902.

| KIND.                                                     | TOTAL.     |                  | COMMERCIAL. |                  | MUNICIPAL. |                  | PER CENT OF INCREASE. |             |            |
|-----------------------------------------------------------|------------|------------------|-------------|------------------|------------|------------------|-----------------------|-------------|------------|
|                                                           | 1907       | 1902             | 1907        | 1902             | 1907       | 1902             | Total.                | Commercial. | Municipal. |
| Incandescent lamps .....                                  | 41,445,997 | 18,194,044       | 37,393,549  | 16,616,593       | 4,052,448  | 1,577,451        | 127.8                 | 125.0       | 156.9      |
| Sixteen-candlepower .....                                 | 35,640,612 | 15,557,843       | 32,153,240  | 14,126,123       | 3,487,372  | 1,451,720        | 129.1                 | 127.6       | 143.6      |
| Thirty-two-candlepower .....                              | 1,408,610  | 574,667          | 1,242,415   | 531,309          | 166,195    | 43,358           | 145.1                 | 133.8       | 283.3      |
| All other candlepower .....                               | 4,396,775  | 2,061,534        | 3,997,894   | 1,959,161        | 398,881    | 102,373          | 113.3                 | 104.1       | 289.6      |
| Other varieties of lamps—Nernst, vacuum, vapor, etc ..... | 162,338    | ( <sup>1</sup> ) | 153,468     | ( <sup>1</sup> ) | 8,870      | ( <sup>2</sup> ) |                       |             |            |

<sup>1</sup> Exclusive of 266,242 lamps used by the central stations to light their own electric properties.

<sup>2</sup> Exclusive of 1,755 lamps used by the central stations to light their own electric properties.

<sup>3</sup> Not reported separately.

The total number of incandescent lamps more than doubled between the censuses of 1902 and 1907, the increase being 23,251,953 lamps, or 127.8 per cent. Although this increase was mostly in 16-candlepower lamps, it also represents lamps varying from street lamps and those of 32 candlepower to the very small sign lamps. The increase is exclusive of 162,338 lamps of "other varieties," chiefly Nernst, and of 266,242 lamps used by the central stations to light their own properties.

The schedules used at both censuses were prepared in such a way that the number of incandescent lamps should be reported as of the following three classes: 16 candlepower, 32 candlepower, and all other candlepower. The wording of the inquiry was such as to ascertain the number of these lamps wired for service on December 31, or the last day of the period covered by the report, and not the actual number in use at different times during the year.

The continually decreasing practice of renting incandescent lamps for general commercial uses on a flat-rate basis and, as a consequence, the increasing use of meters to measure the amount of current consumed, render it no longer necessary in the majority of cases for the central stations to know the number of lamps wired for service or of machines in use, and although some companies reported the number of incandescent lamps, in accordance with the requirements of the schedule, many of the large companies claimed to have such limited knowledge of the number of these lamps wired for service that they were reluctant, and in some instances declined, to give even an estimate of the several varieties, but confined their answers to the inquiry to an estimate of the total number of incandescent lamps on a 16-candlepower basis. In view of these conditions, the results should be accepted only as an approximation of the total number of incandescent lamps wired for service and also of the

classes by candlepower. The actual number of arc lamps was reported by practically all companies.

In 1907, 3,136 companies reported lamps of 32 candlepower. There were 956 companies that reported none of this size, either because they actually had none of this size or because they prepared their schedule for the estimated number of incandescent lamps on a 16-candlepower basis. The remaining 504 stations that had incandescent lamps wired for service, so far as their equipment in that respect is concerned, reported 16's and "other varieties" or only "other varieties." The 956 central stations which reported no lamps of 32 candlepower reported a total of 13,407,883 lamps of 16 candlepower, or nearly one-third of the incandescent lamps reported by all stations. In this connection, however, it should not be forgotten that many of the companies which reported lamps of 32 candlepower stated that the number was estimated.

An attempt was made by correspondence on the subject with a number of central stations to obtain the proper ratio by which to reduce the total number of incandescent lamps shown in Table 50 to lamps of a uniform 16 candlepower. Applying the same ratio of reduction to the total number of lamps of all other varieties, it was found that the total lamps in question were equivalent to 40,656,220 incandescent lamps of 16 candlepower in 1907, and to 17,737,944 in 1902, an increase of 22,918,276, or 129.2 per cent. The difference of increase, as shown in Table 50 and as estimated on a basis of 16 candlepower, is smaller than might be expected, 333,677, or but little more than 1 per cent.

More than nine-tenths of the incandescent lamps were reported at each of the two censuses by the commercial stations, the actual proportions contributed by the municipal stations being 9.8 per cent in 1907 and 8.7 per cent in 1902.

The following statement shows the number of central stations, classified according to the kind of lamps wired for service, December 31, 1907:

*Central electric stations—Number, by lamp equipment: 1907.*

|                                                      |       |
|------------------------------------------------------|-------|
| Total number of stations.....                        | 4,714 |
| With incandescent lamps.....                         | 4,596 |
| With lamps of 32 candlepower.....                    | 3,136 |
| With lamps of 16 candlepower only <sup>1</sup> ..... | 956   |
| Without incandescent lamps.....                      | 118   |
| With arc lamps.....                                  | 3,700 |
| Without arc lamps.....                               | 1,014 |
| Without either incandescent or arc lamps.....        | 68    |

<sup>1</sup> These 956 stations reported nearly one-third of the total number of incandescent lamps, and most of them reported only an estimate of the number of lamps on a 16-candlepower basis, because it was impracticable to answer the inquiries on the schedule in detail.

The increase in the use of electric light and the importance of the industry may perhaps be illustrated most satisfactorily by comparing the number of lamps with the population. Such a comparison is made in Table 51 for the 8 states that contained the largest number of incandescent lamps in 1907 and 1902.

The striking features of this table are the concentration in a comparatively few states of a large proportion of the electric lamps, and the great increase in the average number of lamps per 1,000 population. The 8 states here shown contained nearly two-thirds of the total number of both arc and incandescent lamps, the proportions for the two classes being practically the same, but represented a considerably smaller proportion of the total population, which fact merely illustrates the larger general use of the electric light in the thickly settled communities. Of the 8

states, Missouri shows the lowest and California the highest average number of lamps per 1,000 population. The population of Missouri is more than twice as great as that of California, but it is evident that the electrical development there has not reached the importance that it has in California. Both states contain a considerable proportion of rural population, which has been supplied with electricity more generally in California than in Missouri. In California a number of hydro-electric plants have been established throughout the state, primarily to supply current to large cities located at a distance, but these plants also supply intervening smaller places for which electricity might not otherwise be available. This condition contributes naturally toward the more extensive use of the electric light and an increase in the number of lamps. Although California holds a low comparative rank in population, it being the twenty-first state, it ranks fourth in the number of incandescent lamps and ninth in the number of arc lamps. In 1902 the state ranked fifth in the number of incandescent lamps and seventh in the number of arc lamps. Next to California, which has the smallest population of the 8 states shown in Table 51, New York, which is the most populous state of the Union, has the greatest average number of arc lamps per 1,000 inhabitants, and Massachusetts, the third largest average for arc lamps and the second largest for incandescent lamps.

TABLE 51.—CENTRAL ELECTRIC STATIONS—ARC AND INCANDESCENT LAMPS, FOR THE 8 STATES HAVING THE LARGEST NUMBERS OF INCANDESCENT LAMPS: 1907 AND 1902.

| STATE.                         | ARC LAMPS. |         | INCANDESCENT LAMPS. |            | PER CENT DISTRIBUTION. |       |                     |       | AVERAGE NUMBER OF LAMPS PER 1,000 POPULATION. |       |                     |        |
|--------------------------------|------------|---------|---------------------|------------|------------------------|-------|---------------------|-------|-----------------------------------------------|-------|---------------------|--------|
|                                |            |         |                     |            | Arc lamps.             |       | Incandescent lamps. |       | Arc lamps.                                    |       | Incandescent lamps. |        |
|                                | 1907       | 1902    | 1907                | 1902       | 1907                   | 1902  | 1907                | 1902  | 1907                                          | 1902  | 1907                | 1902   |
| Total for United States.....   | 555,713    | 385,698 | 41,445,997          | 18,194,044 | 100.0                  | 100.0 | 100.0               | 100.0 | 6.50                                          | 4.91  | 484.57              | 231.55 |
| Total for selected states..... | 358,114    | 252,316 | 25,817,953          | 11,817,849 | 64.4                   | 65.4  | 62.3                | 65.0  | 9.89                                          | 7.55  | 712.99              | 353.46 |
| New York.....                  | 97,529     | 59,130  | 6,991,406           | 3,705,525  | 17.6                   | 15.3  | 16.9                | 20.4  | 11.63                                         | 7.85  | 833.63              | 491.90 |
| Pennsylvania.....              | 66,777     | 47,722  | 3,861,171           | 1,783,683  | 12.0                   | 12.4  | 9.3                 | 9.8   | 9.49                                          | 7.34  | 549.01              | 274.16 |
| Illinois.....                  | 55,309     | 38,215  | 3,582,178           | 1,567,665  | 10.0                   | 9.9   | 8.6                 | 8.6   | 10.02                                         | 7.61  | 649.16              | 312.31 |
| California.....                | 19,691     | 15,764  | 3,067,383           | 1,006,875  | 3.5                    | 4.1   | 7.4                 | 5.5   | 11.75                                         | 10.25 | 1,831.04            | 654.73 |
| Massachusetts.....             | 33,899     | 28,790  | 2,650,724           | 1,420,963  | 6.1                    | 7.5   | 6.4                 | 7.8   | 10.99                                         | 9.87  | 859.78              | 487.00 |
| Ohio.....                      | 43,849     | 31,839  | 2,254,467           | 934,213    | 7.9                    | 8.3   | 5.4                 | 5.1   | 9.75                                          | 7.49  | 501.30              | 219.69 |
| Michigan.....                  | 23,514     | 17,712  | 1,711,689           | 805,127    | 4.2                    | 4.6   | 4.1                 | 4.4   | 9.00                                          | 7.14  | 655.37              | 324.55 |
| Missouri.....                  | 17,576     | 13,144  | 1,698,935           | 593,798    | 3.2                    | 3.4   | 4.1                 | 3.3   | 5.16                                          | 4.12  | 498.82              | 186.32 |

The largest increases in the number of arc lamps are shown for New York, Pennsylvania, Illinois, Ohio, Indiana, New Jersey, Michigan, and Massachusetts. For the incandescent lamps large increases occur in so many states that it is difficult to select any as showing the greatest development, but in the following states the numbers for 1907 are at least three times as great as for 1902: Alabama, California, Idaho, Kansas, Kentucky, Maryland, Nebraska, Nevada, North Carolina, Oklahoma, Oregon, South Caro-

lina, and Washington. While these 13 states show the greatest proportional increases in the number of lamps, they do not represent the largest absolute increases, as their combined increase is exceeded by the gain in the total for the 2 states of New York and Pennsylvania.

The 162,338 lamps reported as "other varieties" in 1907 include those that were considered by certain of the establishments reporting as not properly belonging to the first group of incandescents. These

new types of lamps were not reported separately at the census of 1902, and, as already stated, it is probable that in 1907 lamps that properly should have been assigned to this group were included by many stations in the total for incandescent lamps. The total for 1907, however, included a number of the new varieties of lamps and, although thought to be far from complete, they are shown in the following statement:

*Central electric stations—Lamps other than regular arc and incandescent, by kind: 1907.*

| KIND OF LAMP.       | Number. |
|---------------------|---------|
| Total.....          | 162,338 |
| Nernst.....         | 124,899 |
| Meridian.....       | 5,214   |
| Gem.....            | 3,343   |
| Tantalum.....       | 2,467   |
| Vapor.....          | 1,282   |
| Tungsten.....       | 582     |
| Vacuum.....         | 138     |
| Not designated..... | 24,413  |

The central stations were requested to name the lamps other than the regular arc and incandescent, but some reported a number without any designation, and the 24,413 "Not designated" no doubt include

some that might properly have been assigned to one or more of the other groups.

The use of electric lamps for advertising and decorative purposes has resulted in greatly increasing the varieties in use, and has also added to the difficulty of ascertaining the actual number wired for service on a given date. It was impossible, therefore, with a fair degree of accuracy to show separately the number of 16, 32, and other candlepower incandescent lamps, as was done at the census of 1902. However, the schedule used at the census of 1907 required that the number of 32-candlepower lamps wired for service be reported separately, and 3,136 stations reported 1,408,610, while the same stations reported a total of 27,248,337 incandescent lamps of all varieties. Using the ratio of these totals as a basis, the estimated number of 32-candlepower lamps wired for service at the close of 1907 was about 2,112,915.

*Meters on consumption circuits.*—It was impracticable to obtain statistics concerning the size of the meters in service, and therefore the extension of the service can be shown only by the number of meters. That the number has increased rapidly since 1902 is shown by Table 52.

TABLE 52.—CENTRAL ELECTRIC STATIONS—METERS ON CONSUMPTION CIRCUITS, FOR THE 8 STATES HAVING THE GREATEST NUMBERS OF METERS: 1907 AND 1902.

| STATE.                         | TOTAL NUMBER. |         | Per cent of increase. | AVERAGE NUMBER PER STATION. |       | NUMBER OF CUSTOMERS FURNISHED CURRENT. <sup>1</sup> | AVERAGE NUMBER OF METERS PER CUSTOMER. <sup>1</sup> |
|--------------------------------|---------------|---------|-----------------------|-----------------------------|-------|-----------------------------------------------------|-----------------------------------------------------|
|                                | 1907          | 1902    |                       | 1907                        | 1902  | 1907                                                | 1902                                                |
| Total for United States.....   | 1,683,917     | 582,689 | 189.0                 | 357.2                       | 161.0 | 1,946,979                                           | 0.9                                                 |
| Total for selected states..... | 981,461       | 361,230 | 171.7                 | 495.9                       | 209.5 | 1,057,853                                           | 0.9                                                 |
| New York.....                  | 217,462       | 73,789  | 194.7                 | 692.6                       | 288.2 | 201,701                                             | 1.1                                                 |
| Illinois.....                  | 146,206       | 59,836  | 144.3                 | 381.7                       | 172.9 | 167,645                                             | 0.9                                                 |
| California.....                | 143,384       | 34,224  | 319.0                 | 1,111.5                     | 297.6 | 173,029                                             | 0.8                                                 |
| Pennsylvania.....              | 142,186       | 56,874  | 150.0                 | 434.8                       | 203.8 | 160,957                                             | 0.9                                                 |
| Ohio.....                      | 92,964        | 31,508  | 195.0                 | 341.8                       | 135.2 | 100,071                                             | 0.9                                                 |
| Massachusetts.....             | 87,824        | 56,969  | 54.2                  | 731.9                       | 499.7 | 80,713                                              | 1.1                                                 |
| Michigan.....                  | 78,950        | 29,272  | 169.7                 | 337.4                       | 145.6 | 87,500                                              | 0.9                                                 |
| Indiana.....                   | 72,483        | 18,758  | 286.4                 | 362.4                       | 104.2 | 86,237                                              | 0.8                                                 |

<sup>1</sup> Information not available for 1902.

The gain of 189 per cent in the number of meters no doubt indicates fairly well how complete the change has been from the flat-rate method of charging, so largely used at the earlier period of electric-station work, to the use of meters. There have been many and important changes in central-station practice during the short period between the two censuses, but none is more important, from the commercial point of view, than the general adoption of meter rates.

To obtain the total number of meters used for the sale of electricity it is necessary to add to the number shown in Table 52, the number on the consumers' circuits of electric-railway companies. There were 213,886 meters reported by such companies in 1907 and 56,601 in 1902, making the aggregates for the two

censuses 1,897,803 and 639,290, respectively, showing an increase of 1,258,513, or 196.9 per cent.

The 8 states represented in this table are those in which central stations have had the greatest development in the installment of meters, and contained 58.3 per cent of the total number of meters reported for all central stations in 1907 and 62 per cent of the total reported for 1902. The percentages of increase and the average number per customer indicate, however, that the practice has become very general.

The average number of meters per station is to some extent misleading because of differences due to peculiar conditions in certain states. In California, for instance, there is one company which generates electric current at a long distance from the main point of distribution

and supplies it to towns and cities in 22 counties, whereas a service of this sort in other states probably would be represented by a number of separate stations, so that the average number of meters per station would be considerably smaller. Probably the best indication of the growth in the use of meters may be had from the fact that of the 4,714 stations in 1907 only 629, or 13.3 per cent of the total, reported no meters, while in 1902, of a total of 3,620 stations, 901, or 24.9 per cent, reported none. The mechanical meter has now

come into such general use that the number of chemical and other varieties of meters were not reported separately in 1907 as they were in 1902.

*Transformers in circuits for customers.*—The increased use of alternating dynamos has necessarily been accompanied by an increase in the number of machines for lowering the pressure of the circuit. Step-down alternating-current transformers are in general use where alternating dynamos are employed.

TABLE 53.—CENTRAL ELECTRIC STATIONS—NUMBER AND KILOWATT CAPACITY OF TRANSFORMERS IN CIRCUITS FOR CUSTOMERS, FOR THE 8 STATES HAVING THE GREATEST KILOWATT CAPACITY: 1907 AND 1902.

| STATE.                         | 1907    |                    | 1902    |                    | Per cent of increase in kilowatt capacity. | PER CENT OF TOTAL KILOWATT CAPACITY. |       | AVERAGE CAPACITY. |      |
|--------------------------------|---------|--------------------|---------|--------------------|--------------------------------------------|--------------------------------------|-------|-------------------|------|
|                                | Number. | Kilowatt capacity. | Number. | Kilowatt capacity. |                                            | 1907                                 | 1902  | 1907              | 1902 |
| Total for United States.....   | 299,489 | 2,058,567          | 207,370 | 687,121            | 199.6                                      | 100.0                                | 100.0 | 6.9               | 3.3  |
| Total for selected states..... | 169,674 | 1,326,338          | 113,046 | 425,715            | 211.6                                      | 64.4                                 | 62.0  | 7.8               | 3.8  |
| New York.....                  | 32,466  | 496,046            | 18,036  | 142,383            | 248.4                                      | 24.1                                 | 20.7  | 15.3              | 7.9  |
| California.....                | 21,625  | 213,633            | 9,490   | 40,368             | 332.7                                      | 10.4                                 | 7.2   | 9.9               | 5.2  |
| Pennsylvania.....              | 37,578  | 195,742            | 29,005  | 62,258             | 214.4                                      | 9.5                                  | 9.1   | 5.2               | 2.1  |
| Illinois.....                  | 20,331  | 99,067             | 15,040  | 46,615             | 113.0                                      | 4.8                                  | 6.8   | 4.9               | 3.1  |
| Massachusetts.....             | 16,165  | 94,324             | 12,284  | 41,786             | 125.7                                      | 4.6                                  | 6.1   | 5.8               | 3.4  |
| Ohio.....                      | 18,991  | 91,064             | 11,925  | 34,600             | 163.2                                      | 4.4                                  | 5.0   | 4.8               | 2.9  |
| Michigan.....                  | 10,222  | 72,663             | 7,695   | 26,995             | 169.2                                      | 3.5                                  | 3.9   | 7.1               | 3.5  |
| Indiana.....                   | 12,296  | 63,799             | 9,581   | 21,810             | 192.5                                      | 3.1                                  | 3.2   | 5.2               | 2.3  |

The figures in this table represent only the transformers owned by the central stations. The number used by electric-railway companies was not reported at either census. As transformers are sometimes owned by the customers, the total shown in the table, 299,489, is somewhat less than the actual number used in connection with central-station service. The number of machines has, however, increased rapidly since 1902, but not so fast as their kilowatt capacity. This condition is due primarily to the fact that the old-style transformers in use in 1902 have been largely replaced by machines of much larger capacity, the average capacity per machine having more than doubled during the five years ending with 1907.

There were 1,126 stations in 1907 and 967 in 1902 that reported no transformers in use, the proportions being 23.9 and 26.7 per cent of the total number of stations at the respective censuses.

*Stationary motors.*—The schedule used at the census of 1902 called for the number of all kinds of stationary motors, including fan motors, while that for 1907 expressly excluded the latter class. No doubt many fan motors were reported at the census of 1902, but to what extent it is impossible to ascertain.

It was often extremely difficult to ascertain the horsepower capacity of the motors, the current to operate which was sometimes transmitted long distances to factories where the interest of the central station furnishing the electricity was confined to the amount of current consumed as measured by the

meters. It was necessary, therefore, to obtain estimates of the number and capacity of the motors. These estimates were included in the totals given in Table 54, which shows, for the United States and for the 8 states reporting the greatest horsepower capacity, the number and capacity of all stationary motors reported at the two censuses.

Next to lighting, stationary-motor service is the most important source of income for central electric stations, but the introduction of meters has complicated the difficulties attending the collection of statistics concerning the number and capacity of the motors. It is probable, therefore, that the totals in Table 54 are somewhat less than the actual number of motors wired at the end of the respective census years. Many large factories have the machinery operated entirely by electric power and some contain many motors for which statistics had to be obtained from the manufacturers, as the central stations were concerned only with the quantity of current sold.

As shown by Table 45, there were a number of stationary motors supplied with current by electric-railway companies which must be considered in arriving at the totals for this class of service. The figures in Table 54 indicate that the average size of the motors in the central stations has more than doubled since 1902, while the number increased by only 65.4 per cent, a difference in ratio of increase which is without doubt due to the fact that some large central stations reported the horsepower of the motors for which current was

supplied but expressed their inability to give even an estimate of the number of machines. This condition was pronounced in Pennsylvania, where the increase in the average capacity of the motors was excep-

tionally large—from 2.16 horsepower in 1902 to 12.17 horsepower in 1907. One large company in this state reported nearly one-third of its total stationary-motor power but was unable to state the number of motors.

TABLE 54.—CENTRAL ELECTRIC STATIONS—NUMBER AND HORSEPOWER CAPACITY OF STATIONARY MOTORS, FOR THE 8 STATES HAVING THE GREATEST HORSEPOWER CAPACITY: 1907 AND 1902.

| STATE.                         | 1907    |             | 1902    |             | AVERAGE CAPACITY. |      | Per cent of increase in horsepower. | PER CENT OF TOTAL HORSEPOWER. |       |
|--------------------------------|---------|-------------|---------|-------------|-------------------|------|-------------------------------------|-------------------------------|-------|
|                                | Number. | Horsepower. | Number. | Horsepower. | 1907              | 1902 |                                     | 1907                          | 1902  |
| Total for United States.....   | 167,184 | 1,649,026   | 101,064 | 438,005     | 9.86              | 4.33 | 276.5                               | 100.0                         | 100.0 |
| Total for selected states..... | 106,321 | 1,107,687   | 67,037  | 309,655     | 10.42             | 4.62 | 257.7                               | 67.2                          | 70.7  |
| New York.....                  | 18,061  | 393,955     | 13,581  | 109,277     | 21.82             | 8.05 | 260.5                               | 23.9                          | 24.9  |
| California.....                | 11,560  | 200,067     | 5,190   | 50,296      | 17.31             | 9.69 | 297.8                               | 12.1                          | 11.5  |
| Illinois.....                  | 21,675  | 137,661     | 11,838  | 35,928      | 6.35              | 3.03 | 283.2                               | 8.3                           | 8.2   |
| Pennsylvania.....              | 10,063  | 122,461     | 14,144  | 30,560      | 12.17             | 2.16 | 300.7                               | 7.4                           | 7.0   |
| Massachusetts.....             | 15,877  | 81,246      | 9,663   | 35,749      | 5.12              | 3.70 | 127.3                               | 4.9                           | 8.2   |
| Ohio.....                      | 13,083  | 64,941      | 5,704   | 21,956      | 4.96              | 3.85 | 198.8                               | 3.9                           | 6.0   |
| Missouri.....                  | 8,923   | 54,111      | 4,646   | 14,552      | 6.06              | 3.13 | 271.8                               | 3.3                           | 3.3   |
| Michigan.....                  | 7,089   | 53,245      | 2,271   | 11,337      | 7.51              | 4.99 | 369.7                               | 3.2                           | 2.6   |

The state of California, although having a comparatively small population, ranks second in the horsepower of its stationary-motor service, being outranked only by New York. This high rank is due to the scarcity of fuel in the state; the ease with which electric power may be transmitted and made available in sparsely settled sections; and its adaptability for use on dredgers and for many other purposes connected with mining and irrigation.

Modern central-station companies concern them-

selves little with the various uses made of the current sold. The quantity is measured, and as a rule the producers make no inquiry as to its use. Electricity is used for a multitude of miscellaneous purposes which consume, however, but a small proportion of the amount generated, much the larger portion being used for light and power. Table 55 shows the number of stations which sold current for the various purposes during the years 1907 and 1902.

TABLE 55.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF STATIONS, BY CHARACTER OF SERVICE: 1907 AND 1902.

| CHARACTER OF SERVICE.           | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |      | PER CENT OF INCREASE. |             |            |
|---------------------------------|--------|-------|-------------|-------|------------|------|-----------------------|-------------|------------|
|                                 | 1907   | 1902  | 1907        | 1902  | 1907       | 1902 | Total.                | Commercial. | Municipal. |
| Arc lighting:                   |        |       |             |       |            |      |                       |             |            |
| Commercial.....                 | 2,381  | 2,020 | 1,840       | 1,667 | 541        | 353  | 17.9                  | 10.4        | 53.3       |
| Public.....                     | 3,298  | 2,522 | 2,206       | 1,810 | 1,062      | 712  | 30.8                  | 21.9        | 53.4       |
| Incandescent lighting:          |        |       |             |       |            |      |                       |             |            |
| Commercial.....                 | 4,538  | 3,484 | 3,385       | 2,752 | 1,153      | 732  | 30.3                  | 23.0        | 57.5       |
| Public.....                     | 3,345  | 2,491 | 2,327       | 1,889 | 1,018      | 602  | 34.3                  | 23.2        | 60.1       |
| Motor power:                    |        |       |             |       |            |      |                       |             |            |
| Stationary.....                 | 2,009  | 1,093 | 1,659       | 975   | 350        | 118  | 83.8                  | 70.2        | 196.6      |
| Electric-railway.....           | 217    | 159   | 211         | 157   | 6          | 2    | 36.5                  | 34.4        | 200.0      |
| All other electric service..... | 999    | 161   | 831         | 152   | 168        | 9    | 520.5                 | 446.7       | 1,766.7    |

There were only 68 central stations in 1907 which reported that the entire amount of electricity generated during the year was sold for motor service, disposed of in bulk to other electric or railway companies, or sold for some purpose other than lighting; all the other stations reported the sale of current for lighting. That electric lighting is the chief business of the central sta-

tions is shown also by the fact that of the total income, almost three-fourths was from lighting and about one-sixth from stationary-motor service.

*Average size of station.*—The number of lamps, meters, transformers, and motors is an indication of the size of the central station, and averages based on the numbers of these machines are given in Table 56.

TABLE 56.—Commercial and municipal central electric stations—  
Average number of lamps, meters, transformers, and motors per  
station and average capacity per machine: 1907 and 1902.

|                                         | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|-----------------------------------------|--------|-------|-------------|-------|------------|-------|
|                                         | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Arc lamps:                              |        |       |             |       |            |       |
| Average number per station.....         | 118    | 107   | 137         | 119   | 66         | 62    |
| Incandescent lamps:                     |        |       |             |       |            |       |
| Average number per station.....         | 8,792  | 5,026 | 10,801      | 5,924 | 3,237      | 1,936 |
| Meters on consumption circuits:         |        |       |             |       |            |       |
| Average number per station.....         | 357    | 161   | 424         | 188   | 172        | 70    |
| Transformers in circuits for customers: |        |       |             |       |            |       |
| Average number per station.....         | 64     | 57    | 74          | 64    | 35         | 34    |
| Kilowatt capacity per machine.....      | 7      | 3     | 7           | 3     | 4          | 3     |
| Kilowatt capacity per station.....      | 437    | 190   | 548         | 218   | 129        | 92    |
| Stationary motors:                      |        |       |             |       |            |       |
| Average number per station.....         | 35     | 28    | 47          | 35    | 4          | 2     |
| Horsepower per motor.....               | 10     | 4     | 10          | 4     | 7          | 2     |
| Horsepower per station.....             | 350    | 121   | 467         | 155   | 25         | 4     |

Although there are conflicting elements entering into the details from which these totals are obtained, the figures are of sufficient accuracy to establish the fact that the averages for 1907 show great increases over the averages for 1902.

*Line construction.*—The report on central electric stations for 1902 presents statistics for 125,144.14 miles of mains and feeders contained in overhead, underground, and submarine construction. Comparatively few companies, however, had definite knowledge of the miles of wire strung, and it was exceedingly difficult to obtain satisfactory answers to the census inquiries on the subject. In 1907, therefore, the inquiry on the subject was confined to the single question as to the number of miles of street occupied by underground conduits for mains and feeders, for which a total of 2,509.15 miles was reported. Of this total, 2,268.34 miles were reported by commercial stations and 240.81 miles by municipal stations.

## CHAPTER V. CAPITALIZATION.

*Basis of statistics.*—The statistics of capitalization of central electric light and power stations are confined to the par value of the authorized and outstanding preferred and common stock and bonds of commercial corporations, the par value of the bonds issued by municipalities to secure funds for the construction, purchase, or operation of the municipal stations, and the returns made on such capitalization in the form of dividends or interest. For 909 stations owned by individuals, private companies, or cooperative associations, which were not incorporated and had no stock, no statistics of capitalization could be reported. In addition, 21 companies which operated both electric light and power stations and electric railways reported their entire capitalization in connection with the inquiry on street railways; 9 stations, which are reported separately in the tables showing the number of companies, represent stations owned by corporations operating other stations which reported the capitalization of these 9 stations in the same or another state; while 7 companies did not report capitalization. In the cases of 254 municipal stations, bonds originally issued by the city to secure funds for their construction, purchase, or operation had been retired, and for this or other reasons no statistics of capitalization could be secured. Deducting these plants, there remain 2,516 commercial and 998 municipal stations for which statistics of capitalization are shown.

*Increase since 1902.*—A presentation of statistics as to the capital stock, funded debt, dividends, and interest on funded debt of all companies and municipal stations having outstanding investment securities is given for 1907 and 1902 in Table 57.

Although the number of municipal stations having outstanding bonds was relatively larger in 1907 than in 1902—constituting 28.4 per cent of the aggregate number of companies and municipal stations reporting capital stock or funded debt in 1907 compared with 24.3 per cent in 1902—the funded debt of the municipal stations constituted but 4 per cent of the total funded debt in 1907 as compared with 4.4 per cent in 1902. The aggregate amount of interest paid on funded debt was \$27,991,762 in 1907 and \$12,623,545 in 1902, the interest on the municipal bonds constituting 4.1 per cent of the former amount and 4 per cent of the latter amount. The funded debt of the municipal stations represented 1.9 per cent of the total capitalization outstanding in both 1907 and 1902.

TABLE 57.—*Capital stock, funded debt, dividends, and interest paid on funded debt of commercial companies, and funded debt and interest of municipal stations having bonds outstanding: 1907 and 1902.*

|                                                                                              | 1907            | 1902          | Per cent of increase. |
|----------------------------------------------------------------------------------------------|-----------------|---------------|-----------------------|
| Number of commercial companies and municipal stations having outstanding capitalization..... | 3,514           | 2,705         | 29.9                  |
| Commercial companies.....                                                                    | 2,516           | 2,049         | 22.8                  |
| Municipal stations reporting bonds outstanding.....                                          | 998             | 656           | 52.1                  |
| Total capitalization outstanding.....                                                        | \$1,367,338,836 | \$639,125,363 | 113.9                 |
| Capital stock.....                                                                           | 741,317,497     | 372,951,952   | 98.8                  |
| Funded debt.....                                                                             | 626,021,339     | 266,173,411   | 135.2                 |
| Commercial companies:                                                                        |                 |               |                       |
| Total capitalization outstanding.....                                                        | 1,341,995,182   | 627,515,875   | 113.9                 |
| Capital stock—                                                                               |                 |               |                       |
| Authorized, par value.....                                                                   | 900,092,160     | 435,178,372   | 106.8                 |
| Common.....                                                                                  | 798,873,386     | 407,807,934   | 95.9                  |
| Preferred.....                                                                               | 101,218,774     | 27,370,438    | 269.8                 |
| Outstanding, par value.....                                                                  | 741,317,497     | 372,951,952   | 98.8                  |
| Common.....                                                                                  | 666,003,772     | 349,080,281   | 90.8                  |
| Preferred.....                                                                               | 75,313,725      | 23,871,671    | 215.5                 |
| Dividends, amount.....                                                                       | 19,300,572      | 6,189,837     | 211.8                 |
| On common stock.....                                                                         | 16,883,812      | 5,560,341     | 203.6                 |
| On preferred stock.....                                                                      | 2,416,760       | 629,496       | 283.9                 |
| Funded debt—                                                                                 |                 |               |                       |
| Authorized, amount.....                                                                      | 815,516,672     | 308,117,894   | 164.7                 |
| Outstanding, amount.....                                                                     | 600,677,685     | 254,563,923   | 136.0                 |
| Interest.....                                                                                | 26,842,330      | 12,118,740    | 121.5                 |
| Municipal stations:                                                                          |                 |               |                       |
| Funded debt—                                                                                 |                 |               |                       |
| Authorized, amount.....                                                                      | 29,031,638      | 12,625,482    | 129.9                 |
| Outstanding, amount.....                                                                     | 25,343,554      | 11,609,488    | 118.3                 |
| Interest.....                                                                                | 1,149,432       | 504,805       | 127.7                 |

<sup>1</sup> Exclusive of 37 companies (21 operating electric railways with capitalization included in report for street and electric railways; 9 duplications due to corporations reporting capitalization in one state and owning establishments in another state, which are reported separately in certain of the tables; and 7 not reporting capitalization for sundry reasons), but including 2 companies reporting bonds only, their capital stock not being separable from other interests.

*Capitalization of commercial companies.*—While the capitalization of the commercial companies shows a large increase from 1902 to 1907—the total outstanding capitalization increasing 113.9 per cent—this increase is in harmony with the growth in the production of electricity as indicated by the increase in kilowatt output for these stations, which was 141.1 per cent. Of the total outstanding capitalization of the commercial companies in 1907, 55.2 per cent represented capital stock compared with a corresponding percentage of 59.4 in 1902, and 44.8 per cent represented funded debt as compared with a corresponding percentage of 40.6 in 1902. That is, the proportion of the total capitalization represented by capital stock has been appreciably reduced, while that represented by funded debt has increased. This falling off in the relative importance of capital stock is confined to common stock, which formed 49.6 per cent of the total capitalization in 1907 compared with 55.6 per cent in 1902, while the proportion represented by preferred stock increased from 3.8 per cent of the total capitalization in 1902 to

5.6 per cent in 1907. The average outstanding capitalization per system increased in harmony with the general growth. For 1907 the average total capitalization per system was \$533,384 compared with \$306,255 in 1902, or a general average increase of 74.2 per cent. These averages represent an average amount of capital stock outstanding per system in 1907 of \$294,641 compared with \$182,017 in 1902, or an average increase of 61.9 per cent; and an average amount of funded debt in 1907 of \$238,743 compared with \$124,238 in 1902, or an average increase of 92.2 per cent.

The aggregate amount of funded debt shows an increase of 136 per cent compared with an increase of 98.8 per cent for capital stock. Though there was an increase of 215.5 per cent in the par value of preferred stock outstanding, the average increase for all stock is much smaller, owing to the lower rate of increase for common stock. The very satisfactory condition of the industry is evidenced by the increase in average dividend rates and the decrease in the average interest rate. The interest paid represents an average rate of 4.47 per cent on the total amount of outstanding funded debt in 1907 compared with an average rate of 4.76 per cent in 1902, and the dividends paid represent an average rate of 2.6 per cent in 1907 on the total amount of outstanding stock compared with an average rate of 1.66 per cent in 1902; while the total amount of dividends and interest paid in 1907 represents an average rate of 3.44 per cent on the total volume of outstanding securities, including both stocks and bonds, compared with an average rate of 2.92 per cent in 1902. The funded debt reported in 1907, however, includes \$9,270,800 upon which no interest was paid. Eliminating this debt the average rate of interest upon the funded debt of the commercial companies upon which interest was paid becomes 4.54 per cent, which is the same as the average rate of interest for the outstanding bonds of the municipal stations. The allied industries tend to confuse all the statistics for the central electric stations, but especially those relating to capitalization. They make it difficult to draw any conclusion for the industry as a whole in regard to the increase in capitalization as compared with the increase of equipment, expenses, and income. It is significant, however, that of the 2,049 commercial companies having outstanding capitalization in 1902, only 41 reported the payment of dividends on preferred stock and 561 the payment of dividends on common stock; while of the 2,516 companies having outstanding capitalization in 1907, there were 101 which paid dividends on preferred stock and 661 which paid dividends on common stock. The average rate of dividend on preferred stock for the companies which paid dividends on such stock in 1907 was 5.39 per cent and in 1902, 5.16 per cent. The average rate on common stock for companies which paid dividends on common stock in 1907 was 5.25 per cent and in 1902, 4.4 per cent.

In this connection a comparison of the average return on the capitalization of the central electric light and power stations with that for the other electrical industries which represent public utilities may be of interest. The following statement shows the average rate per cent which the interest paid on funded debt and dividends paid on capital stock represent on the total outstanding capitalization of the incorporated companies in the electric light and power, street and electric railway, and telegraph and telephone industries. It should be borne in mind, however, that these rates are computed on the total outstanding capitalization, including that upon which no dividends or interest were paid.

*Average rate of return on capitalization of incorporated companies:  
1907 and 1902.*

| INDUSTRY.                                      | AVERAGE RATE,<br>PER CENT. |      |
|------------------------------------------------|----------------------------|------|
|                                                | 1907                       | 1902 |
| Central electric light and power stations..... | 3.44                       | 2.92 |
| Street and electric railways.....              | 3.34                       | 3.32 |
| Telegraph and telephone companies.....         | 4.46                       | 5.23 |

The average rate of return on outstanding capitalization in 1902 was larger both for street and electric railways and for telegraph and telephone companies than for commercial companies operating central electric light and power stations, but in 1907 the latter class of companies reported a higher average rate than did the street and electric railways, though this rate was still exceeded by the average rate for the telegraph and telephone industries.

*Capitalization of purely electric and composite companies.*—The report for 1902 does not permit a comparative presentation to be made for the two censuses in respect to the capitalization of commercial companies classified according to the character of the business done, but in 1902, 1,302 of the 2,049 commercial companies having outstanding capitalization, or 63.5 per cent, were purely electric and 747, or 36.5 per cent, were composite. A further idea as to the probable distribution of the total capitalization between the two classes of companies in 1902 may be gained from the statistics in reference to interest, the interest payments of the purely electric companies amounting to \$8,767,252, or 72.3 per cent of the total interest paid on funded debt, while those of the composite companies amounted to \$3,351,488, or 27.7 per cent of the total interest on funded debt. From Table 58, which gives the distribution of capitalization between the purely electric and the composite companies in 1907, it will be seen that the capitalization of companies engaged exclusively in the generation and sale of electric current formed only 49.1 per cent of the total capitalization of all incorporated companies for which statistics were secured.



TABLE 58.—*Purely electric and composite companies—Capital stock, funded debt, dividends, and interest: 1907.*

|                                           | All companies.  | Purely electric companies. | Composite companies. | PER CENT OF TOTAL. |            |
|-------------------------------------------|-----------------|----------------------------|----------------------|--------------------|------------|
|                                           |                 |                            |                      | Purely electric.   | Composite. |
| Number of companies.....                  | 2,516           | 1,542                      | 974                  | 61.3               | 38.7       |
| Total capitalization outstanding.....     | \$1,341,995,182 | \$659,206,602              | \$682,788,580        | 49.1               | 50.9       |
| Capital stock outstanding, par value..... | 741,317,497     | 375,681,037                | 365,636,460          | 50.7               | 49.3       |
| Common.....                               | 666,003,772     | 348,191,966                | 317,811,806          | 52.3               | 47.7       |
| Preferred.....                            | 75,313,725      | 27,489,071                 | 47,824,654           | 36.5               | 63.5       |
| Dividends, amount.....                    | 19,300,572      | 11,072,882                 | 8,227,690            | 57.4               | 42.6       |
| On common stock.....                      | 16,883,812      | 10,312,935                 | 6,570,877            | 61.1               | 38.9       |
| On preferred stock.....                   | 2,416,760       | 759,947                    | 1,656,813            | 31.4               | 68.6       |
| Funded debt outstanding, amount.....      | 600,677,685     | 283,525,565                | 317,152,120          | 47.2               | 52.8       |
| Interest.....                             | 26,842,330      | 12,296,086                 | 14,546,244           | 45.8               | 54.2       |

The total capitalization is fairly well distributed between the two classes of companies, though the purely electric companies greatly outnumber the composite companies. It will be observed, however, that the composite companies reported nearly two-thirds of the preferred stock outstanding.

In Table 58 and all other tables containing statistics of capitalization the total capital stock and funded debt of each company are included, except where specially noted, but it is manifest that a considerable proportion of this capitalization is not properly chargeable to the central electric stations. All companies which reported the operation of an electric station in connec-

tion with some other industry and which kept no distinctive capital account, furnished an estimate as to the proportion of the outstanding capitalization which was chargeable to the electric light and power department. These estimates ranged from 1 to 99 per cent, depending upon the relative importance of the electric portion of the business. By means of a computation based upon these estimates the sum of \$381,958,476 is obtained as the estimated par value of the capitalization represented by the electric portion of the business of the companies classified as composite. In addition, a small portion of the capitalization of the companies in the purely electric class, amounting to \$5,681,307, is, in like manner, chargeable to other than electric light and power interests, making the capitalization of this class of companies which is chargeable to electric stations \$653,525,295. By combining these two amounts, \$1,035,483,771 is obtained as the capitalization chargeable to the central electric light and power stations, instead of \$1,341,995,182, as shown in Table 58, the difference of \$306,511,411 being the estimated capitalization not chargeable to the electric stations, but representing industries carried on in connection with the electric light and power industry, such as gas and ice plants, waterworks, sawmills, steam heating, mines, quarries, etc. Table 59 shows for 1907 this distribution of capitalization and the dividends and interest chargeable, respectively, to the electric light and power industry and to the allied industries.

TABLE 59.—DISTRIBUTION OF CAPITALIZATION, DIVIDENDS, AND INTEREST BETWEEN THE ELECTRIC LIGHT AND POWER INDUSTRY AND ALLIED INDUSTRIES: 1907.

|                                                                           | Capitalization. | DIVIDENDS AND INTEREST. |                         |              |              | PER CENT DISTRIBUTION.  |        |            |           |
|---------------------------------------------------------------------------|-----------------|-------------------------|-------------------------|--------------|--------------|-------------------------|--------|------------|-----------|
|                                                                           |                 | Total.                  |                         | Dividends.   | Interest.    | Dividends and Interest. |        |            |           |
|                                                                           |                 | Amount.                 | Average rate, per cent. |              |              | Capitalization.         | Total. | Dividends. | Interest. |
| Total.....                                                                | \$1,341,995,182 | \$46,142,902            | 3.44                    | \$19,300,572 | \$26,842,330 | 100.0                   | 100.0  | 100.0      | 100.0     |
| Electric light and power industry.....                                    | 1,035,483,771   | 35,803,408              | 3.46                    | 15,159,573   | 20,643,835   | 77.2                    | 77.6   | 78.5       | 76.9      |
| Purely electric companies.....                                            | 653,525,295     | 23,241,772              | 3.56                    | 11,030,537   | 12,211,235   | 48.7                    | 50.4   | 57.2       | 45.6      |
| Composite companies, chargeable to electric light and power industry..... | 381,958,476     | 12,561,636              | 3.29                    | 4,129,036    | 8,432,600    | 28.5                    | 27.2   | 21.4       | 31.4      |
| Allied industries.....                                                    | 306,511,411     | 10,339,494              | 3.37                    | 4,140,999    | 6,198,495    | 22.8                    | 22.4   | 21.5       | 23.1      |

<sup>1</sup> Includes \$5,681,307 reported for companies classified as purely electric, upon which dividends and interest amounting to \$127,196 were paid as follows: Dividends, \$42,345; Interest, \$84,851.

Of the total capitalization, 77.2 per cent is chargeable to the electric light and power industry and 22.8 per cent to other interests. Although the returns on capitalization have been distributed for the reports on composite plants according to the estimated proportion of the outstanding capitalization chargeable to the electric light and power plant department, yet this is an assumption that may or may not be correct and undoubtedly will not hold good in many cases. In

some instances these allied industries may be conducted at a loss and the bond interest and dividends, if any, be paid from the profits of the electric plant; in others the electric plant may be operated at a loss and the interest and dividends be paid from the profits of the allied industries. The Census Bureau collected no statistics concerning profits on the year's business or the source of the money expended in the payment of interest or dividends.

*Capitalization and cost of construction.*—The capitalization reported does not include promissory notes and other temporary obligations, which in some instances amount to considerable sums. On the other hand, the stock and bonds were in some instances sold for less than the par value, and therefore the par value is correspondingly greater than the actual amount invested. There are also cases in which the market value of the stock is considerably in excess of the par value. In any event the capitalization as reported to the Census Bureau should not be accepted as representing the cash actually invested, as it by no means represents cost of physical equipment, etc., but includes earning capacity, good will, etc. In spite of this fact, however, the aggregate capitalization reported approximates very closely the amount reported as cost of plant. The 2,516 commercial companies reported \$1,027,182,892 as the cost of plant, which includes land, buildings, machinery, tools and implements, overhead and underground construction, lamps, motors, meters, transformers wired for use, and all supplies on hand. Although the total capitalization of these companies amounts to \$1,341,995,182, yet if the estimated amount chargeable to the allied interests, \$306,511,411, is deducted, the balance of \$1,035,483,771 chargeable to the electric light and power industry approximates very closely the amount reported as cost of plant, the difference being but eight-tenths of 1 per cent.

Many companies as they now exist are consolidations of other companies. In some instances a portion or all of the capitalization of the subsidiary companies has been retired, but frequently the entire capitalization of both the parent and subsidiary companies is included in the census reports. A portion of this capitalization is undoubtedly based on the earning capacity rather than on the actual value of the plant or the amount of cash invested. On the other hand, the application of earnings to new construction and betterments tends to lower the ratio of capitalization to cost of construction.

*Analysis of dividends and interest.*—The return on capital invested is, from a financial standpoint, the matter of chief interest in connection with capitalization and the most important statistics on this subject for 1907 are therefore assembled in Table 60.

Of the 2,516 incorporated companies having outstanding capitalization, 183, or 7.3 per cent, reported preferred stock, and 1,129, or 44.9 per cent, reported funded debt. In the aggregate, returns in the form of dividends or interest were made on a capitalization of \$957,741,023, or 71.4 per cent of the total amount outstanding, this comprising \$321,509,301 of common stock, or 48.3 per cent of the total common stock outstanding; \$44,824,837 of preferred stock, or 59.5 per cent of the total preferred stock outstanding; and \$591,406,885 of funded debt, this latter amount repre-

senting all of the funded debt, except \$9,270,800 upon which interest was not paid.

The very close correspondence between the average rates of dividends on dividend-paying common and preferred stocks is a noticeable feature. The average rate of dividends on the dividend-paying common stock was 5.25 per cent, and on the dividend-paying preferred stock 5.39 per cent. As already stated, the average rate of interest on funded debt on which interest was paid was 4.54 per cent.

TABLE 60.—*Analysis of dividends and interest: 1907.*

|                                                                        |               |
|------------------------------------------------------------------------|---------------|
| Number of companies                                                    | 2,516         |
| Common stock:                                                          |               |
| Number of companies reporting                                          | 2,514         |
| Number of companies declaring dividends                                | 661           |
| Amount outstanding, par value                                          | \$666,008,772 |
| Amount on which dividends were declared                                | \$321,509,301 |
| Per cent dividend-paying stock forms of all common stock               | 48.3          |
| Amount of dividends                                                    | \$16,883,812  |
| Average rate of dividends on all common stock, per cent                | 2.54          |
| Average rate of dividends on dividend-paying common stock, per cent    | 5.25          |
| Preferred stock:                                                       |               |
| Number of companies reporting                                          | 183           |
| Number of companies declaring dividends                                | 101           |
| Amount outstanding, par value                                          | \$75,313,725  |
| Amount on which dividends were declared                                | \$44,824,837  |
| Per cent dividend-paying stock forms of all preferred stock            | 59.5          |
| Amount of dividends                                                    | \$2,416,760   |
| Average rate of dividends on all preferred stock, per cent             | 3.21          |
| Average rate of dividends on dividend-paying preferred stock, per cent | 5.39          |
| Funded debt:                                                           |               |
| Number of companies reporting                                          | 1,129         |
| Number of companies paying interest                                    | 1,078         |
| Amount outstanding                                                     | \$600,677,685 |
| Amount on which interest was paid                                      | \$591,406,885 |
| Amount of interest                                                     | \$26,842,330  |
| Average rate of interest, per cent                                     | 4.54          |

<sup>1</sup> Including 2 companies reporting bonds only, their capital stock not being separable from other interests.

Table 61 shows the capitalization of the companies paying either dividends on stock or interest on funded debt and of those which made no return on capitalization.

TABLE 61.—*Capitalization—Amount, dividends, and interest for companies paying either dividends on stock or interest on funded debt, and amount for companies paying neither dividends nor interest: 1907.*

|                                                  | COMPANIES REPORTING CAPITALIZATION. |                                                                        |                                                                          |
|--------------------------------------------------|-------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                                                  | Total.                              | Companies paying either dividends on stock or interest on funded debt. | Companies paying neither dividends on stock nor interest on funded debt. |
| Number of companies                              | 2,516                               | 1,496                                                                  | 1,020                                                                    |
| Capitalization:                                  |                                     |                                                                        |                                                                          |
| Amount outstanding, par value                    | \$1,341,995,182                     | \$1,275,409,707                                                        | \$66,525,475                                                             |
| Amount of dividends and interest                 | \$46,142,902                        | \$46,142,902                                                           | .....                                                                    |
| Average rate of dividends and interest, per cent | 3.44                                | 3.62                                                                   | .....                                                                    |

<sup>1</sup> Exclusive of 37 companies (21 operating electric railways with capitalization included in report for street and electric railways; 9 duplications due to corporations reporting capitalization in one state and owning establishments in another state, which are reported separately in certain of the tables; and 7 not reporting capitalization for sundry reasons), but including 2 companies reporting bonds only, their capital stock not being separable from other interests.

The capitalization reported for the 1,496 companies paying either dividends on stock or interest on funded debt is the total capitalization of these companies, and it includes capitalization upon which no return was made. For example, some companies paid interest on

bonds, but did not pay dividends on either preferred or common stock, and other companies paid dividends on preferred stock, but not on their common stock. The total outstanding stock and bonds of both classes of companies is included in this table. In Tables 62 to 65, inclusive, the analysis is extended to the dividend-paying stocks, common and preferred, and to the funded debt.

It is to be noted that the amount of stocks or bonds reported as outstanding is the amount outstanding at the close of the year covered by the report, and includes in many cases stocks or bonds issued during the year, while on the other hand it does not include any bonds which may have been retired during the year and on which interest was paid. The average rate of return in the shape of dividends or interest has necessarily to be computed on the basis of the amount of stocks or bonds reported as outstanding and on a twelve-month basis; hence, to the extent that dividends or interest were paid on stock or bonds issued during the year and therefore not for a full year, and also to the extent that interest was paid on bonds retired during the year, the average rates per cent are affected, but this element of error is believed to be so small as not to affect the results appreciably.

The number of companies paying dividends on either or both classes of stock constituted 28.7 per cent of the total number, and the outstanding stock of these companies constituted 55.7 per cent of the total amount of stock outstanding. This of course includes the common stock of companies paying dividends on preferred stock only as well as the common stock upon which dividends were paid.

Comparing Table 60 with Table 62 it will be seen that there were 61 companies paying dividends on preferred stock but not on common stock, these companies

having \$46,755,484 of common stock outstanding. From Table 129, which gives a detailed summary by states, the average dividend rate for all common stock in the several states may be deduced. Of the states reported separately, Massachusetts has the highest average dividend rate on common stock, 8.23 per cent, followed by Rhode Island, with 5.41 per cent; Connecticut, with 4.9 per cent; and New Hampshire, with 4.81 per cent. In 1902, of the states reported separately, Massachusetts, Rhode Island, Connecticut, and West Virginia were the leading states in respect to the average rate of dividends on common stock, with 7.26, 5.6, 4.77, and 4.61 per cent, respectively. In 1907, 18 states showed an average dividend of less than 1 per cent on the total outstanding common stock, or no returns at all on this class of stock, as compared with 21 states in 1902.

TABLE 62.—*Capital stock—Amount and dividends for companies paying dividends either on common or preferred stock, and amount for companies not paying dividends: 1907.*

|                                      | COMPANIES REPORTING CAPITALIZATION. |                                                                 |                                                                   |
|--------------------------------------|-------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|
|                                      | Total.                              | Companies paying dividends on either common or preferred stock. | Companies paying dividends on neither common nor preferred stock. |
| Number of companies.....             | 2,514                               | 722                                                             | 1,792                                                             |
| Capital stock:                       |                                     |                                                                 |                                                                   |
| Amount outstanding, par value....    | \$741,317,497                       | \$413,089,622                                                   | \$328,227,875                                                     |
| Amount of dividends.....             | \$19,300,572                        | \$19,300,572                                                    | .....                                                             |
| Average rate of dividends, per cent. | 2.60                                | 4.67                                                            | .....                                                             |

A distribution or classification of the common stock of the companies paying dividends on common stock, according to rates of dividends, is of interest as showing the prevailing rate or rates. Such a classification is given in Table 63.

TABLE 63.—COMMON STOCK—AMOUNT AND DIVIDENDS FOR COMPANIES PAYING DIVIDENDS, GROUPED BY RATE OF DIVIDENDS, AND AMOUNT FOR COMPANIES NOT PAYING DIVIDENDS: 1907.

|                                                     | Number of companies. | COMMON STOCK, PAR VALUE. |                        |               |                        |              |                        |                         |
|-----------------------------------------------------|----------------------|--------------------------|------------------------|---------------|------------------------|--------------|------------------------|-------------------------|
|                                                     |                      | Authorized.              |                        | Outstanding.  |                        | Dividends.   |                        |                         |
|                                                     |                      | Amount.                  | Per cent distribution. | Amount.       | Per cent distribution. | Amount.      | Per cent distribution. | Average rate, per cent. |
| Companies reporting common stock.....               | 2,514                | \$796,873,386            | 100.0                  | \$666,003,772 | 100.0                  | \$16,883,812 | 100.0                  | 2.54                    |
| Companies paying dividends on common stock.....     | 661                  | 378,019,099              | 47.3                   | 321,500,301   | 48.3                   | 16,883,812   | 100.0                  | 5.25                    |
| Rate of dividends:                                  |                      |                          |                        |               |                        |              |                        |                         |
| Less than 1 per cent.....                           | 2                    | 3,750,000                | 0.5                    | 3,582,500     | 0.5                    | 17,010       | 0.1                    | 0.47                    |
| 1 per cent but less than 2.....                     | 16                   | 14,235,000               | 1.8                    | 14,101,400    | 2.1                    | 171,290      | 1.0                    | 1.21                    |
| 2 per cent but less than 3.....                     | 35                   | 12,582,500               | 1.6                    | 11,568,800    | 1.7                    | 253,620      | 1.5                    | 2.19                    |
| 3 per cent but less than 4.....                     | 48                   | 38,372,000               | 4.8                    | 24,816,630    | 3.7                    | 731,059      | 4.3                    | 2.95                    |
| 4 per cent but less than 5.....                     | 46                   | 10,277,366               | 1.3                    | 9,174,666     | 1.4                    | 366,986      | 2.2                    | 4.00                    |
| 5 per cent but less than 6.....                     | 98                   | 96,341,950               | 12.1                   | 75,694,700    | 11.4                   | 2,846,735    | 16.9                   | 3.76                    |
| 6 per cent but less than 7.....                     | 141                  | 76,540,983               | 9.6                    | 60,950,196    | 10.5                   | 4,101,328    | 24.3                   | 5.86                    |
| 7 per cent but less than 8.....                     | 26                   | 60,942,300               | 7.6                    | 55,310,185    | 8.3                    | 2,853,152    | 16.9                   | 5.16                    |
| 8 per cent but less than 9.....                     | 67                   | 30,052,600               | 3.8                    | 25,412,100    | 3.8                    | 1,954,800    | 11.6                   | 7.69                    |
| 9 per cent but less than 10.....                    | 7                    | 1,060,000                | 0.1                    | 1,026,575     | 0.2                    | 92,415       | 0.5                    | 9.00                    |
| 10 per cent and over.....                           | 175                  | 33,864,400               | 4.2                    | 30,871,550    | 4.6                    | 3,495,417    | 20.7                   | 11.32                   |
| Companies not paying dividends on common stock..... | 1,853                | 420,854,287              | 52.7                   | 344,494,471   | 51.7                   |              |                        |                         |

The companies paying dividends on common stock formed 26.3 per cent of the total number, and the out-

standing common stock of these companies formed 48.3 per cent of the total amount outstanding; that

is, nearly three-fourths of the companies paid no dividends at all upon their common stock, and no dividends were paid on more than one-half of the common stock outstanding.

The rate of dividends indicated for each group frequently is not paid on the entire amount of outstanding stock credited to the group. The stock reported as outstanding is the amount outstanding at the close of the year and includes any stock which may have been issued during the year, even near its close, and on which dividends were not paid, and also the total outstanding common stock of companies, although dividends were paid on a portion only of their common stock. The rates reported are such as were given in the schedules, except in a few cases where the amount of the dividend was reported and the rate omitted, in which case the rate was established in the office by its relation to the outstanding stock. It must be under-

stood, therefore, that the rate refers only to the amount of stock on which the dividends were declared, but the amount of this dividend stock was not reported. For these reasons, in several of the rate groups, the average rate computed from the amount of common stock outstanding and the amount paid in dividends on common stock falls short of the group rate.

A noticeable feature of this table is the relatively large number of companies paying dividends of 10 per cent or over, these companies constituting 26.5 per cent of the companies paying dividends on common stock. Next to this group the largest number of companies paying dividends on common stock is shown for the group with a rate of 6 per cent but less than 7, which also shows the largest amount disbursed as dividends on common stock of any group.

The preferred stock on which dividends were paid, distributed by rate groups, is shown in Table 64.

TABLE 64.—PREFERRED STOCK—AMOUNT AND DIVIDENDS FOR COMPANIES PAYING DIVIDENDS, GROUPED BY RATE OF DIVIDENDS, AND AMOUNT FOR COMPANIES NOT PAYING DIVIDENDS: 1907.

|                                                        | Number of companies. | PREFERRED STOCK, PAR VALUE. |                        |              |                        |             |                                                |
|--------------------------------------------------------|----------------------|-----------------------------|------------------------|--------------|------------------------|-------------|------------------------------------------------|
|                                                        |                      | Authorized.                 |                        | Outstanding. |                        | Dividends.  |                                                |
|                                                        |                      | Amount.                     | Per cent distribution. | Amount.      | Per cent distribution. | Amount.     | Per cent distribution. Average rate, per cent. |
| Companies reporting preferred stock.....               | 183                  | \$101,218,774               | 100.0                  | \$75,313,725 | 100.0                  | \$2,416,760 | 100.0 3.21                                     |
| Companies paying dividends on preferred stock.....     | 101                  | 61,664,274                  | 60.9                   | 44,824,837   | 59.5                   | 2,416,760   | 100.0 5.39                                     |
| Rate of dividends:                                     |                      |                             |                        |              |                        |             |                                                |
| 1 per cent but less than 2.....                        | 1                    | 200,000                     | 0.2                    | 110,833      | 0.1                    | 1,663       | 0.1 1.50                                       |
| 2 per cent but less than 3.....                        | 2                    | 1,044,000                   | 1.0                    | 244,000      | 0.3                    | 5,880       | 0.2 2.41                                       |
| 3 per cent but less than 4.....                        | 6                    | 368,900                     | 0.4                    | 368,900      | 0.5                    | 11,067      | 0.5 3.00                                       |
| 4 per cent but less than 5.....                        |                      |                             |                        |              |                        |             |                                                |
| 5 per cent but less than 6.....                        | 27                   | 24,280,500                  | 24.0                   | 19,418,600   | 25.8                   | 938,379     | 38.8 4.83                                      |
| 6 per cent but less than 7.....                        | 50                   | 34,474,674                  | 34.1                   | 23,432,304   | 31.1                   | 1,369,845   | 56.7 5.85                                      |
| 7 per cent but less than 8.....                        | 10                   | 1,013,700                   | 1.0                    | 967,700      | 1.3                    | 67,739      | 2.8 7.00                                       |
| 8 per cent and over.....                               | 5                    | 282,500                     | 0.3                    | 282,500      | 0.4                    | 22,187      | 0.9 7.85                                       |
| Companies not paying dividends on preferred stock..... | 82                   | 39,554,500                  | 39.1                   | 30,488,888   | 40.5                   |             |                                                |

The companies paying dividends on preferred stock formed 55.2 per cent of the total number having preferred stock, and the preferred stock of these companies constituted 59.5 per cent of the total amount of preferred stock outstanding. Of the companies paying dividends, those reporting a rate of 6 per cent but less than 7 are most numerous and reported the major portion of the dividends paid on preferred stock.

Table 65 shows the number of companies reporting funded debt at the census of 1907, the amount of debt, both authorized and outstanding, and the amount of interest paid. It also distinguishes between the companies that did and did not pay interest.

The amount shown as interest on funded debt is not the total interest chargeable for the year on the total outstanding debt. It is common practice to charge all or a part of the interest to the plant account while construction is going on, and hence in such cases the total amount of interest on funded debt does not appear in the income account from which the census figures of interest on funded debt are taken, but only that portion of it which is charged against income. There were other conditions also which operated in

certain cases to prevent the showing of interest on funded debt in the statistics, such as the use of bonds as collateral for floating debt and the waiver of the payment of interest by special agreement, not to mention the defaulting of interest. There were 51 companies with funded debt outstanding which for various reasons did not show any interest charge in the income account. The companies reporting funded debt formed 44.9 per cent of the total number, and interest was paid upon all but 1.5 per cent of the total amount outstanding.

TABLE 65.—Funded debt—Amount and interest for companies paying interest and amount for companies not paying interest: 1907.

|                                         | COMPANIES REPORTING FUNDED DEBT. |                            |                                |
|-----------------------------------------|----------------------------------|----------------------------|--------------------------------|
|                                         | All companies.                   | Companies paying interest. | Companies not paying interest. |
| Number of companies.....                | 1,129                            | 1,078                      | 51                             |
| Funded debt:                            |                                  |                            |                                |
| Amount authorized.....                  | \$815,516,672                    | \$788,113,672              | \$27,403,000                   |
| Amount outstanding.....                 | \$600,677,685                    | \$591,406,885              | \$9,270,800                    |
| Amount of interest.....                 | \$26,842,330                     | \$26,842,330               |                                |
| Average rate of interest, per cent..... | 4.47                             | 4.54                       |                                |

In Table 66 the companies having funded debt are classified according to the rate of interest on their bonds. In cases where companies had bond issues bearing different rates of interest, they are classified according to the average rate paid on the whole debt.

TABLE 66.—Companies reporting funded debt, grouped by rate of interest: 1907.

|                                                   | COMPANIES REPORTING FUNDED DEBT. |                        |
|---------------------------------------------------|----------------------------------|------------------------|
|                                                   | Number.                          | Per cent distribution. |
| Companies reporting funded debt.....              | 1,129                            | 100.0                  |
| Companies paying interest on funded debt.....     | 1,078                            | 95.5                   |
| Rate of interest:                                 |                                  |                        |
| Less than 4 per cent.....                         | 11                               | 1.0                    |
| 4 per cent but less than 5.....                   | 63                               | 5.8                    |
| 5 per cent but less than 6.....                   | 638                              | 59.2                   |
| 6 per cent but less than 7.....                   | 334                              | 31.0                   |
| 7 per cent but less than 8.....                   | 23                               | 2.1                    |
| 8 per cent and over.....                          | 9                                | 0.8                    |
| Companies not paying interest on funded debt..... | 51                               | 4.5                    |

Capitalization statistics of companies, classified according to dynamo capacity.—A large majority of the com-

panies organized since 1902 are comparatively small, and while some large companies have been organized to construct new plants, most of them have been formed by the reorganization and consolidation of companies that were in existence in 1902. These reorganizations are made for the avowed purpose of effecting economies that are not possible in the small companies. This being the case, it would be expected that the larger companies would secure greater profit on the year's business, which in turn would be reflected in a larger rate of dividends on the capital stock. While the census classification of companies according to size on the basis of dynamo capacity is not a perfect classification for the purpose indicated, it is of interest, and the statistics are presented in Table 67.

Of the total number of companies in 1907, 162, or 6.4 per cent, purchased current and hence form a class by themselves. The capitalization of these companies represented 5.5 per cent of the total capitalization, and averaged \$456,017 per company, compared with an average of \$538,709 per company for the 2,354 companies equipped with dynamos and generating current.

TABLE 67.—CAPITALIZATION STATISTICS OF COMMERCIAL COMPANIES, CLASSIFIED ACCORDING TO DYNAMO CAPACITY OF STATIONS: 1907.

| DYNAMO CAPACITY OF STATIONS IN KILOWATTS.   | CAPITALIZATION.                |                 |                         |                         | CAPITAL STOCK.                 |               |              |                         |
|---------------------------------------------|--------------------------------|-----------------|-------------------------|-------------------------|--------------------------------|---------------|--------------|-------------------------|
|                                             | Number of companies reporting. | Amount.         | Dividends and interest. |                         | Number of companies reporting. | Amount.       | Total.       |                         |
|                                             |                                |                 | Amount.                 | Average rate, per cent. |                                |               | Amount.      | Average rate, per cent. |
| Total.....                                  | 2,516                          | \$1,341,995,182 | \$46,142,902            | 3.44                    | 2,514                          | \$741,317,497 | \$19,300,572 | 2.60                    |
| Under 200.....                              | 1,281                          | 50,680,027      | 1,258,055               | 2.48                    | 1,279                          | 39,710,805    | 719,929      | 1.81                    |
| 200 but under 500.....                      | 534                            | 64,807,465      | 1,509,489               | 2.33                    | 534                            | 42,440,398    | 506,033      | 1.19                    |
| 500 but under 1,000.....                    | 207                            | 80,606,542      | 1,881,907               | 3.11                    | 207                            | 35,003,975    | 604,544      | 1.73                    |
| 1,000 but under 2,000.....                  | 150                            | 129,337,257     | 3,866,422               | 2.99                    | 150                            | 78,524,091    | 1,447,998    | 1.84                    |
| 2,000 but under 5,000.....                  | 109                            | 210,387,010     | 7,069,083               | 3.36                    | 109                            | 122,263,210   | 3,263,396    | 2.67                    |
| 5,000 and over.....                         | 73                             | 752,302,191     | 27,818,119              | 3.70                    | 73                             | 384,844,788   | 11,668,681   | 3.03                    |
| Companies without generating equipment..... | 162                            | 73,874,690      | 2,739,877               | 3.71                    | 162                            | 38,530,290    | 1,100,091    | 2.86                    |

| DYNAMO CAPACITY OF STATIONS IN KILOWATTS.   | CAPITAL STOCK—continued.       |               |              |                         |                                |              |             |                         | FUNDED DEBT.                   |               |              |                         |
|---------------------------------------------|--------------------------------|---------------|--------------|-------------------------|--------------------------------|--------------|-------------|-------------------------|--------------------------------|---------------|--------------|-------------------------|
|                                             | Common.                        |               |              |                         | Preferred.                     |              |             |                         | Number of companies reporting. | Amount.       | Interest.    |                         |
|                                             | Number of companies reporting. | Amount.       | Dividends.   | Average rate, per cent. | Number of companies reporting. | Amount.      | Dividends.  | Average rate, per cent. |                                |               | Amount.      | Average rate, per cent. |
| Total.....                                  | 2,514                          | \$666,003,772 | \$16,883,812 | 2.54                    | 183                            | \$75,313,725 | \$2,416,760 | 3.21                    | 1,129                          | \$600,677,685 | \$26,842,330 | 4.47                    |
| Under 200.....                              | 1,279                          | 38,757,905    | 694,358      | 1.79                    | 43                             | 952,900      | 25,571      | 2.68                    | 374                            | 10,969,222    | 538,126      | 4.91                    |
| 200 but under 500.....                      | 534                            | 40,169,155    | 470,434      | 1.17                    | 35                             | 2,271,183    | 35,599      | 1.57                    | 290                            | 22,367,127    | 1,003,456    | 4.49                    |
| 500 but under 1,000.....                    | 207                            | 32,571,675    | 538,129      | 1.65                    | 25                             | 2,432,300    | 66,415      | 2.73                    | 148                            | 25,602,567    | 1,277,363    | 4.99                    |
| 1,000 but under 2,000.....                  | 150                            | 71,831,091    | 1,224,350    | 1.70                    | 28                             | 6,093,000    | 223,648     | 3.34                    | 116                            | 50,813,166    | 2,418,424    | 4.76                    |
| 2,000 but under 5,000.....                  | 109                            | 112,158,110   | 3,037,456    | 2.71                    | 21                             | 10,105,100   | 225,940     | 2.24                    | 86                             | 88,123,800    | 3,805,637    | 4.32                    |
| 5,000 and over.....                         | 73                             | 336,915,946   | 9,961,494    | 2.96                    | 26                             | 47,928,842   | 1,697,087   | 3.54                    | 68                             | 367,457,403   | 16,159,538   | 4.40                    |
| Companies without generating equipment..... | 162                            | 33,569,890    | 957,591      | 2.85                    | 5                              | 4,930,400    | 142,500     | 2.89                    | 47                             | 35,344,400    | 1,639,786    | 4.64                    |

<sup>1</sup> Including 2 companies reporting bonds only, their capital stock not being separable from other interests.

The group of small companies, those operating stations with a dynamo capacity of less than 200 kilowatts, constituted 50.9 per cent of the total number, but their capitalization formed but 3.8 per cent of the total capitalization and averaged but \$39,563 per company. On the other hand, the companies operating stations with a capacity of 5,000 kilowatts or over constituted only 2.9 per cent of the total number, but represented 56.1 per cent of the total capitalization, with an average of \$10,305,509 per company. It should be remembered that the amounts of common stock, preferred stock, and funded debt shown for the several groups are the total amounts outstanding and include nondividend-paying stocks and noninterest-paying bonds as well as those upon which dividends or interest was paid. For this reason, the average rates per cent, as given, do not represent the average rates per cent for stocks upon which dividends were paid or for funded debt upon which interest was paid, but the average return in the form of dividends or interest on the total amounts of stock or funded debt outstanding, respectively. In most cases the average rate of return is better for companies operating stations with a high dynamo capacity than for those operating stations with a low capacity, though the rule does not hold in all cases.

Table 68 shows the per cent distribution of the number of companies reporting, capitalization, and dividends and interest for the several groups, and the average capitalization per company for each group.

TABLE 68.—Per cent distribution, by dynamo capacity, of number of companies, capitalization, and dividends and interest, and average capitalization per company: 1907.

| KILOWATT CAPACITY OF DYNAMOS.               | PER CENT DISTRIBUTION. |                 |                         | Average capitalization per company. |
|---------------------------------------------|------------------------|-----------------|-------------------------|-------------------------------------|
|                                             | All companies.         | Capitalization. | Dividends and interest. |                                     |
| Total.....                                  | 100.0                  | 100.0           | 100.0                   | \$533,384                           |
| Under 200.....                              | 50.9                   | 3.8             | 2.7                     | 39,563                              |
| 200 but under 500.....                      | 21.2                   | 4.8             | 3.3                     | 121,362                             |
| 500 but under 1,000.....                    | 8.2                    | 4.5             | 4.1                     | 292,785                             |
| 1,000 but under 2,000.....                  | 6.0                    | 9.6             | 8.4                     | 862,248                             |
| 2,000 but under 5,000.....                  | 4.3                    | 15.7            | 15.3                    | 1,830,156                           |
| 5,000 and over.....                         | 2.9                    | 56.1            | 60.3                    | 10,305,509                          |
| Companies without generating equipment..... | 6.4                    | 5.5             | 5.9                     | 456,017                             |

The analysis of the statistics might be carried to the point of ascertaining the earnings of the incorporated companies, classified according to dynamo capacity and the relation the earnings bear to the capitalization for the several groups. But any deductions in regard to earnings that might be drawn from these returns are apt to be misleading.<sup>1</sup> The amounts disbursed in the form of interest and dividends by the different groups of companies can be used, how-

ever, in lieu of earnings, as a basis of comparison, and these disbursements for groups of companies will give results which will approximate comparisons of earnings. Hence the fact that the average rate per cent of dividends and interest combined, as well as the average rate per cent of dividends on common stock, as given in Table 67, shows a general tendency to increase with dynamo capacity, can be taken as an indication of the relative increase in the rate of earnings accompanying increase in capitalization. It will be noted also in this connection that the rate of interest on funded debt shows no such increase, but in fact is smaller for the highest group than for the lowest.

As a general rule, increase in capitalization is accompanied by an increase in the proportion of the capitalization represented by both preferred stock and funded debt, with a decrease in the proportion of the capitalization represented by common stock—that is, the larger the capitalization the larger the percentage thereof represented by preferred stock and by funded debt, and the smaller the percentage represented by common stock. Although the application of this rule to individual companies or to small groups of companies would show exceptions, yet it holds good when the companies are grouped on lines broad enough to eliminate minor variations, as shown by the following tabular statement:

Average capitalization per company and per cent distribution of capitalization for groups of companies, classified according to dynamo capacity: 1907.

|                                            | All companies. | COMPANIES WITH A DYNAMO CAPACITY OF— |                                |                                  |                           |
|--------------------------------------------|----------------|--------------------------------------|--------------------------------|----------------------------------|---------------------------|
|                                            |                | Under 200 kilowatts.                 | 200 but under 1,000 kilowatts. | 1,000 but under 5,000 kilowatts. | 5,000 kilowatts and over. |
| Average capitalization per company.....    | \$538,709      | \$39,563                             | \$169,250                      | \$1,311,677                      | \$10,305,509              |
| Per cent distribution: Capitalization..... | 100.0          | 100.0                                | 100.0                          | 100.0                            | 100.0                     |
| Capital stock.....                         | 55.4           | 78.4                                 | 61.8                           | 59.1                             | 51.2                      |
| Common stock.....                          | 49.9           | 78.5                                 | 58.0                           | 54.2                             | 44.8                      |
| Preferred stock.....                       | 5.5            | 1.9                                  | 3.8                            | 4.9                              | 6.4                       |
| Funded debt.....                           | 44.6           | 21.6                                 | 38.2                           | 40.9                             | 48.8                      |

The above statement is confined to the companies having generating equipment. It will be seen that the percentage which common stock forms of the total capitalization decreases uninterruptedly from 76.5 per cent for the lowest group, companies operating stations with a capacity of less than 200 kilowatts, to 44.8 per cent for the highest group, companies operating stations with a capacity of 5,000 kilowatts and over; while the percentage for preferred stock increases uninterruptedly from 1.9 per cent to 6.4 per cent for the successive groups, and the percentage for funded debt from 21.6 per cent to 48.8 per cent.

<sup>1</sup> See p. 87, Ch. VII.

*Municipal stations.*—The increase in the number of municipal stations is naturally accompanied by an increase in the municipal bonds issued on account of these stations.

TABLE 69.—*Municipal stations—Funded debt and interest: 1907 and 1902.*

|                                         | 1907         | 1902         | Per cent of increase. |
|-----------------------------------------|--------------|--------------|-----------------------|
| Number of stations.....                 | 1,252        | 815          | 53.6                  |
| Reporting bonds outstanding.....        | 998          | 656          | 52.1                  |
| Reporting no bonds outstanding.....     | 254          | 159          | 59.7                  |
| Funded debt:                            |              |              |                       |
| Amount authorized.....                  | \$29,031,638 | \$12,625,482 | 129.9                 |
| Amount outstanding.....                 | \$25,343,654 | \$11,609,488 | 118.3                 |
| Amount of interest.....                 | \$1,149,432  | \$504,805    | 127.7                 |
| Average rate of interest, per cent..... | 4.54         | 4.35         |                       |

As a general rule, the rate of interest on the bonds of municipalities is lower than on those of private enterprises, and in 1902 the average rate on municipal bonds issued against light and power stations was 4.35 per cent, compared with a corresponding rate of 4.76 per cent for incorporated commercial companies. But the bond rate for commercial companies shows a lower average in 1907 than in 1902, while a slight increase is shown in the rate for municipal bonds, so that, as before noted, the average rate of interest on the net amount of funded debt of the commercial companies upon which interest was paid in 1907 was the same as that for municipal bonds, 4.54 per cent.

The municipal stations reporting bonds outstanding in 1907 represented 79.7 per cent of the total number compared with 80.5 per cent in 1902, and the outstanding bonds represented 87.3 per cent of the amount authorized in 1907 compared with 92 per cent in 1902. The average amount of bonded indebtedness per station has increased materially, being \$25,394 per station in 1907 compared with \$17,697 in 1902.

The bonded debt of the composite municipal stations formed 57.4 per cent of the total for municipal stations, and the average rate of interest was 4.8 per cent, compared with an average rate of 4.18 per cent for the purely electric municipal stations.

TABLE 70.—*Municipal stations—Funded debt and interest for purely electric and composite stations: 1907.*

|                                         | MUNICIPAL STATIONS. |                  |              |                    |            |
|-----------------------------------------|---------------------|------------------|--------------|--------------------|------------|
|                                         | Total number.       | Purely electric. | Composite.   | Per cent of total. |            |
|                                         |                     |                  |              | Purely electric.   | Composite. |
| Number of stations.....                 | 1,252               | 521              | 731          | 41.6               | 58.4       |
| Number reporting bonds outstanding..... | 998                 | 410              | 588          | 41.1               | 58.9       |
| Funded debt:                            |                     |                  |              |                    |            |
| Amount outstanding.....                 | \$25,343,654        | \$10,799,993     | \$14,543,661 | 42.6               | 57.4       |
| Amount of interest.....                 | \$1,149,432         | \$451,776        | \$697,656    | 39.3               | 60.7       |
| Average rate of interest, per cent....  | 4.54                | 4.18             | 4.80         |                    |            |

In making the reports for municipal stations carrying on business of a composite character, an estimate was given of the proportionate part of the bonded investments chargeable to the electric light and power industry, as was done with respect to capital investments in the case of the commercial companies, and although these estimates are in most cases only approximations and do not represent book values, yet they afford a basis for arriving at a general estimate of the amount of municipal bonds and interest paid thereon represented by the electric light and power industry. Table 71 accordingly shows the estimated amount of bonds chargeable to the electric light and power industry and to the allied industries, respectively.

TABLE 71.—*Municipal stations—Distribution of funded debt and interest between the electric light and power industry and allied industries: 1907.*

|                                       | BONDS OUTSTANDING. |                        | INTEREST.   |                         |
|---------------------------------------|--------------------|------------------------|-------------|-------------------------|
|                                       | Amount.            | Per cent distribution. | Amount.     | Average rate, per cent. |
| Total.....                            | \$25,343,654       | 100.0                  | \$1,149,432 | 4.54                    |
| Electric light and power industry.... | 20,479,798         | 80.8                   | 911,190     | 4.45                    |
| Purely electric stations.....         | 10,697,093         | 42.2                   | 446,883     | 4.18                    |
| Composite stations.....               | 9,782,705          | 38.6                   | 464,307     | 4.75                    |
| Allied industries.....                | 14,863,856         | 19.2                   | 238,242     | 4.90                    |

<sup>1</sup>Includes \$102,600 reported for companies classified as purely electric, upon which interest amounting to \$4,893 was paid.



## CHAPTER VI.

### COST OF CONSTRUCTION AND EQUIPMENT.

*General discussion.*—The schedule used in the census of 1902 called for a separate statement as to the cost of land; buildings; machinery, tools, and implements within stations; overhead electric-service construction; underground electric-service construction; lamps, motors, meters, and transformers, wired for use; supplies of every description on hand; and miscellaneous equipment. The object of these inquiries was to ascertain the total cost of the plant and equipment, as represented by the total amount expended for the original construction and for all subsequent extensions, additions, and repairs to the same. It was presumed that the electric companies kept an account of this kind, but a majority contended that it was impossible to report the cost in such detail, and many asserted that they had no data from which

even the total cost of the plant and equipment to date could be estimated with a fair degree of accuracy. Moreover, a considerable number of the electric stations have changed ownership during recent years, and the purchase price often has little relation to the actual cost of the plant, and in fact seldom, if ever, represents this cost. The transfer is frequently made through the exchange of stock or by some other arrangement, whereby it is impossible to ascertain the money equivalent. In view of these conditions, the attempt to ascertain the cost of construction in such detail was abandoned in 1907, but in an effort to preserve the comparative value of the statistics, the total cost of the plant and equipment to date and the cost of construction during the census year were requested.

**TABLE 72.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—TOTAL COST OF PLANTS AND EQUIPMENT; AVERAGE COST PER KILOWATT CAPACITY OF DYNAMOS AND PER HORSEPOWER CAPACITY OF ENGINES AND WATER WHEELS; AND COST OF CONSTRUCTION DURING THE CENSUS YEAR: 1907 AND 1902.**

|                                                                       | TOTAL.          |               | COMMERCIAL.     |               | MUNICIPAL.   |              |
|-----------------------------------------------------------------------|-----------------|---------------|-----------------|---------------|--------------|--------------|
|                                                                       | 1907            | 1902          | 1907            | 1902          | 1907         | 1902         |
| Total cost of plants and equipment.....                               | \$1,096,913,622 | \$504,740,352 | \$1,054,034,175 | \$482,719,879 | \$42,879,447 | \$22,020,473 |
| Total kilowatt capacity of dynamos.....                               | 2,709,225       | 1,212,235     | 2,500,209       | 1,098,855     | 209,016      | 113,380      |
| Average cost per kilowatt capacity of dynamos.....                    | \$405           | \$416         | \$422           | \$439         | \$205        | \$194        |
| Total horsepower capacity of engines and water wheels.....            | 4,098,188       | 1,845,048     | 3,776,837       | 1,685,020     | 321,351      | 160,028      |
| Average cost per horsepower capacity of engines and water wheels..... | \$268           | \$274         | \$279           | \$286         | \$133        | \$138        |
| Cost of construction during the census year.....                      | \$100,912,573   | \$41,792,447  | \$95,746,208    | \$40,050,613  | \$5,166,365  | \$1,741,824  |

The total cost of all central stations up to the end of the census year 1907 as compared with that similarly reported for 1902 showed an increase of \$592,173,270, or 117.3 per cent. In the same period the total cost reported for the commercial stations, which in 1907 represented 96.1 per cent of the total cost of all stations, and in 1902, 95.6 per cent, increased 118.4 per cent. The corresponding increase for the municipal stations was 94.7 per cent. The average cost of plant and equipment reported for all stations in 1907 was \$232,693; for commercial stations, \$304,458; and for municipal stations, \$34,249. In 1902 the corresponding averages were \$139,431, \$172,093, and \$27,019, respectively.

Many and varying factors enter into the cost of plants and equipment. Sites and rights, which in one instance may cost but little, in another may be very expensive. The installation and equipment of a station designed and prepared to supply current to a large city or thickly settled community, is quite unlike

that of a station transmitting electricity considerable distances and selling in bulk to but few customers. These conflicting elements are encountered in any attempt to arrive at an average cost per station or per kilowatt capacity of dynamo. In endeavoring to arrive at an average cost per dynamo capacity there is always the uncertainty as to the extent of the installation of surplus dynamos, which frequently do not, in a true sense, represent the capacity of the plant, but merely a reserve to be brought into use in case of a breakdown, need for repairs, etc. The decrease in the average cost per horsepower in both commercial and municipal stations and in average cost per kilowatt capacity of dynamos for commercial stations, may be influenced by the fact that in anticipation of future demands upon them, plants have in recent years been constructed with a more general excess of both primary power and dynamo capacity.

In but 1 state, Utah, was the total cost of plants and equipment reported less in 1907 than in 1902, and



in this instance the decrease was due to the fact that one of the largest of the central stations in the state for which statistics were secured in 1902 has since that date been combined with an electric railway, so that in 1907 it was included with the latter branch of the industry.

There were 7 states each of which reported in 1907 a total cost of plants and equipment of more than \$40,000,000. These states, together with the amounts thus reported and the corresponding totals for 1902, are shown in Table 73.

TABLE 73.—Total cost of plants and equipment for states each of which in 1907 reported a total of more than \$40,000,000: 1907 and 1902.

| STATE.                           | TOTAL COST OF PLANTS AND EQUIPMENT. |               |
|----------------------------------|-------------------------------------|---------------|
|                                  | 1907                                | 1902          |
| Total for United States.....     | \$1,096,913,622                     | \$504,740,352 |
| Total for 7 selected states..... | 677,617,993                         | 341,831,031   |
| New York.....                    | 262,731,789                         | 112,998,778   |
| California.....                  | 111,780,551                         | 36,547,474    |
| Illinois.....                    | 88,142,233                          | 38,329,275    |
| Pennsylvania.....                | 73,907,749                          | 41,579,338    |
| New Jersey.....                  | 65,219,445                          | 56,432,502    |
| Massachusetts.....               | 43,279,226                          | 29,562,267    |
| Ohio.....                        | 42,557,000                          | 26,381,397    |

At both censuses the totals for these 7 states formed approximately the same proportion of the corresponding totals for the entire United States, somewhat less than two-thirds in 1907 and slightly more than two-thirds in 1902.

Some of the most notable increases in the state totals in the cost of construction are shown in Table 74.

TABLE 74.—Notable increases in the total cost of construction for 20 selected states in 1907 over the amount reported in 1902.

| STATE.                            | TOTAL COST OF PLANTS AND EQUIPMENT. |               | Actual increase. | Per cent of increase. |
|-----------------------------------|-------------------------------------|---------------|------------------|-----------------------|
|                                   | 1907                                | 1902          |                  |                       |
| Total for United States.....      | \$1,096,913,622                     | \$504,740,352 | \$592,173,270    | 117.3                 |
| Total for 20 selected states..... | 853,914,225                         | 358,809,493   | 495,104,732      | 138.0                 |
| Alabama.....                      | 7,293,876                           | 908,895       | 6,384,981        | 702.5                 |
| California.....                   | 111,780,551                         | 36,547,474    | 75,233,077       | 205.9                 |
| Colorado.....                     | 23,126,179                          | 8,665,826     | 14,460,353       | 166.9                 |
| Georgia.....                      | 7,354,286                           | 1,252,578     | 6,101,708        | 487.1                 |
| Illinois.....                     | 88,142,233                          | 38,329,275    | 49,812,958       | 130.0                 |
| Indiana.....                      | 25,680,710                          | 6,706,510     | 18,974,200       | 282.9                 |
| Maryland.....                     | 21,274,959                          | 7,157,986     | 14,116,973       | 197.2                 |
| Massachusetts.....                | 43,279,226                          | 29,562,267    | 13,716,959       | 46.4                  |
| Michigan.....                     | 37,001,060                          | 11,559,169    | 25,441,891       | 220.1                 |
| Minnesota.....                    | 24,138,081                          | 9,236,505     | 14,901,576       | 161.3                 |
| Missouri.....                     | 33,865,760                          | 15,679,872    | 18,185,888       | 116.0                 |
| Montana.....                      | 17,950,677                          | 4,740,807     | 13,209,870       | 278.6                 |
| Nevada.....                       | 4,299,631                           | 301,785       | 3,997,846        | 1,324.7               |
| New York.....                     | 252,731,789                         | 112,998,778   | 139,733,011      | 123.7                 |
| Ohio.....                         | 42,557,000                          | 26,381,397    | 16,175,603       | 61.3                  |
| Oklahoma.....                     | 7,130,864                           | 507,516       | 6,623,348        | 1,093.4               |
| Pennsylvania.....                 | 73,907,749                          | 41,579,338    | 32,328,411       | 77.8                  |
| South Carolina.....               | 8,803,382                           | 2,442,989     | 6,360,393        | 260.4                 |
| South Dakota.....                 | 2,806,363                           | 623,504       | 2,182,859        | 350.1                 |
| Washington.....                   | 20,789,849                          | 3,537,022     | 17,252,827       | 487.8                 |

The total cost of construction for these 20 states formed more than three-fourths of the total for the

United States in 1907 and only a little less than three-fourths in 1902; the corresponding amount of increase for these states was nearly seven-eighths of the total increase for the country.

For reasons already stated, the cost of the plants as reported to the Census Bureau does not represent the actual cost of installing a central station nor indicate the actual relative costs of stations equipped with water power as compared with those equipped with steam power. The reported cost does, however, give an approximate idea of the cost of construction, and the classification of the total cost reported according to the primary power used in the stations gives additional indication of the relative importance of the different classes of power. This classification is made in Tables 75 and 76.

In comparing the statistics for the different kinds of primary power for 1902 with those for 1907, it should be remembered that stations which in 1902 were operated by either steam or water power might, because of the extension of the service, or for other reasons, find the original power inadequate and by the addition of power of another character, be thrown into a different group in 1907. The extent of these changes is, however, a matter of great uncertainty.

The stations using steam exclusively as primary power in 1907 reported 57.7 per cent of the total cost of plants and equipment for all central stations, and if to this is added the cost of the stations which are practically steam plants but have minor power of some other kind, the proportion reported by stations using steam would be 64.4 per cent. But even this large percentage does not fully represent the cost of the steam equipment, since there is also a large amount represented by the plants in the class using water and steam. The remainder, with the exception of about one-half of 1 per cent of the total cost contributed by the plants equipped with gas as the primary power, represents the cost of plants using water power, or without primary-power equipment. In 1907 the plants using water exclusively reported 11.6 per cent of the total cost, and those equipped with water with other minor power, 2.8 per cent. Thus 14.4 per cent of the total cost was represented by this kind of power, exclusive of the portion represented by stations in the group "water and steam."

In 1907 the North Central states had about three-sevenths of the total number of stations, but the cost of plants and equipment reported for that division was only a little more than one-fourth of the total for all central stations; the North Atlantic division, on the other hand, with about one-half as many stations, reported somewhat less than twice the amount for cost of plants and equipment. The Western division was third, with a little less than one-fifth of the total cost, while the South Atlantic and South Central divisions each reported about one-twentieth.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 75.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—TOTAL COST OF PLANTS AND EQUIPMENT, BY KIND OF PRIMARY POWER: 1907 AND 1902.

| KIND OF POWER.                                | Cen-<br>sus. | TOTAL.                 |                                     | COMMERCIAL.            |                                     | MUNICIPAL.             |                                     |
|-----------------------------------------------|--------------|------------------------|-------------------------------------|------------------------|-------------------------------------|------------------------|-------------------------------------|
|                                               |              | Number of<br>stations. | Cost of plants<br>and<br>equipment. | Number of<br>stations. | Cost of plants<br>and<br>equipment. | Number of<br>stations. | Cost of plants<br>and<br>equipment. |
| Total.....                                    | 1907<br>1902 | 4,714<br>3,620         | \$1,096,913,622<br>504,740,352      | 3,462<br>2,805         | \$1,054,034,175<br>482,719,879      | 1,252<br>815           | \$42,879,447<br>22,020,473          |
| Steam exclusively.....                        | 1907<br>1902 | 3,262<br>2,747         | \$633,050,959<br>325,912,662        | 2,199<br>2,008         | \$598,742,435<br>306,232,439        | 1,063<br>739           | \$4,308,524<br>19,680,223           |
| Steam with other minor power.....             | 1907<br>1902 | 93<br>43               | 73,016,313<br>48,904,865            | 80<br>41               | 72,260,226<br>48,831,365            | 13<br>2                | 756,087<br>73,500                   |
| Water exclusively.....                        | 1907<br>1902 | 474<br>315             | 127,722,346<br>38,387,077           | 413<br>281             | 124,318,422<br>37,319,076           | 61<br>34               | 3,403,924<br>1,068,001              |
| Water with other minor power.....             | 1907<br>1902 | 61<br>20               | 30,900,788<br>14,879,731            | 59<br>19               | 30,836,527<br>14,854,719            | 2<br>1                 | 64,261<br>25,012                    |
| Water and steam.....                          | 1907<br>1902 | 360<br>275             | 176,837,370<br>65,670,174           | 337<br>266             | 174,097,251<br>65,179,991           | 23<br>9                | 2,140,119<br>490,183                |
| Gas exclusively.....                          | 1907<br>1902 | 180<br>51              | 4,634,303<br>2,600,377              | 137<br>38              | 4,040,379<br>2,499,534              | 43<br>13               | 593,924<br>100,843                  |
| Stations without primary-power equipment..... | 1907<br>1902 | 284<br>169             | 50,751,543<br>8,385,466             | 237<br>152             | 49,138,935<br>7,802,755             | 47<br>17               | 1,612,008<br>582,711                |

TABLE 76.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COST OF PLANTS AND EQUIPMENT, BY KIND OF PRIMARY POWER USED AND BY GEOGRAPHIC DIVISIONS: 1907 AND 1902.

| DIVISION.           | Cen-<br>sus. | Num-<br>ber of<br>sta-<br>tions. | Total.                         | Steam<br>exclusively.        | Steam with<br>other minor<br>power. | Water<br>exclusively.       | Water with<br>other minor<br>power. | Water<br>and steam.         | Gas<br>exclusively.      | Stations<br>without<br>primary-<br>power<br>equipment. |
|---------------------|--------------|----------------------------------|--------------------------------|------------------------------|-------------------------------------|-----------------------------|-------------------------------------|-----------------------------|--------------------------|--------------------------------------------------------|
| United States.....  | 1907<br>1902 | 4,714<br>3,620                   | \$1,096,913,622<br>504,740,352 | \$633,050,959<br>325,912,662 | \$73,016,313<br>48,904,865          | \$127,722,346<br>38,387,077 | \$30,900,788<br>14,879,731          | \$176,837,370<br>65,670,174 | \$4,634,303<br>2,600,377 | \$50,751,543<br>8,385,466                              |
| North Atlantic..... | 1907<br>1902 | 1,070<br>913                     | 484,441,333<br>266,548,738     | 287,302,016<br>161,398,717   | 61,814,755<br>42,101,267            | 52,219,507<br>6,975,986     | 3,331,165<br>13,752,012             | 45,882,261<br>36,568,192    | 2,712,242<br>2,144,121   | 31,179,387<br>3,611,443                                |
| South Atlantic..... | 1907<br>1902 | 390<br>251                       | 58,513,594<br>19,462,480       | 40,779,550<br>16,406,853     | 370,000                             | 7,472,369<br>2,041,027      | 4,787,410<br>597,972                | 4,464,121<br>207,100        | 69,578<br>51,800         | 570,586<br>157,728                                     |
| North Central.....  | 1907<br>1902 | 2,065<br>1,706                   | 290,238,111<br>127,495,351     | 211,879,482<br>109,632,429   | 9,657,530<br>1,275,962              | 17,606,655<br>3,744,421     | 9,670,351<br>108,077                | 31,790,294<br>11,786,737    | 1,237,379<br>324,667     | 8,398,420<br>623,038                                   |
| South Central.....  | 1907<br>1902 | 679<br>404                       | 59,366,131<br>22,328,727       | 53,947,895<br>21,885,209     | 837,028<br>15,190                   | 325,905<br>234,551          | .....                               | 3,381,268<br>109,510        | 435,645<br>23,414        | 438,390<br>60,853                                      |
| Western.....        | 1907<br>1902 | 480<br>346                       | 204,354,453<br>68,905,056      | 39,142,016<br>16,589,454     | 337,000<br>5,512,426                | 50,097,910<br>25,391,092    | 13,111,862<br>421,670               | 91,319,426<br>17,001,635    | 179,459<br>56,375        | 10,166,780<br>3,932,404                                |

The cost of plants having steam as the primary power developed most rapidly in the North Atlantic and North Central divisions and least rapidly in the Western division. Measured by the cost of construction, the North Atlantic, Western, and North Central divisions represented the highest development of water power, as did the North Atlantic of stations equipped with gas as the primary power.

The remarkable increase in the cost of plants and equipment reported for stations which are not equipped with primary power was altogether disproportionate to the increase in their number. The use of water power and the ability to deliver the electric energy at long distances from the generating plant, and at a low cost, have brought about a great change in

the installation of power machines and dynamos in central electric stations. New stations have been built without such equipment, sometimes not only purchasing the current but selling the same in bulk to other stations by means of long-transmission lines. Many stations originally equipped with generating apparatus have had such apparatus removed because it has been found to be more economical to purchase current than to generate it. The largest increases for stations not equipped with primary power were in the North Atlantic, North Central, and Western divisions.

In 1902 the cost of construction by character of ownership was not reported, hence comparative figures are not available. These figures, however, are shown for 1907 in Table 77.

TABLE 77.—Total cost of plants and equipment, by character of ownership: 1907.

| CHARACTER OF OWNERSHIP.                 | Total cost of plants and equipment. | Per cent distribution. |
|-----------------------------------------|-------------------------------------|------------------------|
| Total.....                              | \$1,096,913,622                     | 100.0                  |
| Individual.....                         | 6,574,920                           | 0.6                    |
| Firm.....                               | 4,019,813                           | 0.4                    |
| Incorporated company <sup>1</sup> ..... | 1,043,439,442                       | 95.1                   |
| Municipal.....                          | 42,878,447                          | 3.9                    |

<sup>1</sup> Includes 2 establishments classed under the head "All other forms of ownership," in order that the operations of individual establishments may not be disclosed.

This table shows the importance of corporate ownership and the comparative insignificance of all the other forms of ownership so far as they relate to the cost of electric stations. The total cost of construc-

tion for the municipal stations was slightly less than 4 per cent of the total, while that for individuals and firms combined was but 1 per cent.

During the census year 1907, \$100,912,573 was expended for new stations and for additions and extensions to those already in existence. This amount represented an increase of \$59,120,126, or 141.5 per cent, over the amount reported as similarly expended during 1902. For the commercial stations the increase amounted to \$55,695,595, or 139.1 per cent, and for the municipal stations to \$3,424,531, or 196.6 per cent. The total cost of new construction reported for 1907, classified by kind of primary power used in the respective stations, is shown by geographic divisions in Table 78.

TABLE 78.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COST OF CONSTRUCTION DURING THE YEAR, BY KIND OF PRIMARY POWER USED AND BY GEOGRAPHIC DIVISIONS: 1907.

| DIVISION.           | Number of stations. | Total.        | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively. | Stations without primary-power equipment. |
|---------------------|---------------------|---------------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|------------------|-------------------------------------------|
| United States.....  | 4,714               | \$100,912,573 | \$54,505,377       | \$4,413,308                   | \$8,715,446        | \$3,532,877                   | \$13,776,002     | \$643,331        | \$15,326,232                              |
| North Atlantic..... | 1,070               | 41,989,031    | 20,462,608         | 3,613,408                     | 1,872,932          | 122,145                       | 4,080,573        | 233,018          | 11,624,347                                |
| South Atlantic..... | 390                 | 7,023,710     | 5,014,384          | 30,855                        | 496,615            | 1,287,936                     | 126,857          | 2,281            | 64,782                                    |
| North Central.....  | 2,066               | 28,091,301    | 19,652,627         | 610,849                       | 1,999,692          | 1,392,634                     | 2,753,211        | 207,627          | 1,474,661                                 |
| South Central.....  | 679                 | 5,216,238     | 4,784,711          | 133,196                       | 20,953             | .....                         | 108,725          | 145,961          | 22,022                                    |
| Western.....        | 480                 | 18,592,293    | 4,591,047          | 25,000                        | 4,325,254          | 790,162                       | 6,726,636        | 54,444           | 2,139,750                                 |

The cost of construction during the year was distributed among the several geographic divisions in much the same relative proportions as was the total cost of plants and equipment reported, and the same is true also of the expenditures reported during the year upon the stations in most of the different groups, by kind of power used. The Western division, however, for the stations using water exclusively shows a much larger proportion of the total cost of construction during the year for this kind of power than of the total cost of plants and equipment to date for the same kind of power, while the reverse is true for the stations of the Western division which use water as the primary power but have minor power of some other kind.

In 7 states and territories there was a decrease in the total cost of new construction during the census year in 1907 as compared with 1902, namely: Arizona, Iowa, Maine, Massachusetts, Nevada, New Hampshire, and Rhode Island. In each case the decline was due to decreased expenditures on the commercial plants.

In 2 other states—Arkansas and Florida—decreases in the cost of new construction for the commercial plants were more than offset by increases in the amounts expended by municipal stations, so that the totals for the two branches of the industry showed increases.

In 3 states—Delaware, Kentucky, and West Virginia—a decrease was reported for municipal plants, although in each instance the amount was small.

The statistics for some of the states in which the largest amounts were expended by commercial stations on new construction during 1907 are shown in Table 79.

The figures for commercial stations show that the greatest expenditure in new construction during 1907 for plants using steam power occurred in the state of New York, Illinois ranking second in this respect. The greatest amounts for new construction in connection with plants using water power exclusively and for those using both water and steam power were expended in California.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 79.—COMMERCIAL CENTRAL ELECTRIC STATIONS—COST OF CONSTRUCTION DURING THE YEAR FOR SELECTED STATES, BY GEOGRAPHIC DIVISIONS AND KIND OF PRIMARY POWER: 1907.

|                                    | Total.       | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively. | Stations without primary power equipment. |
|------------------------------------|--------------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|------------------|-------------------------------------------|
| Total for commercial stations..... | \$96,746,208 | \$50,540,907       | \$4,268,353                   | \$8,261,987        | \$3,532,027                   | \$13,566,719     | \$541,003        | \$15,035,212                              |
| Total for selected states.....     | 75,892,395   | 39,637,792         | 3,761,152                     | 5,801,188          | 1,657,524                     | 11,043,859       | 315,223          | 13,675,667                                |
| North Atlantic division:           |              |                    |                               |                    |                               |                  |                  |                                           |
| Massachusetts.....                 | 4,613,916    | 3,975,826          | 90,399                        | 19,194             | 776                           | 469,416          | 296              | 58,039                                    |
| New Jersey.....                    | 3,834,018    | 504,827            | 3,297,519                     | 4,980              | 7,075                         | 3,025            | 900              | 15,692                                    |
| New York.....                      | 23,403,555   | 9,988,551          | 17,595                        | 1,363,133          | 24,132                        | 1,119,484        | 26,873           | 11,173,787                                |
| Pennsylvania.....                  | 6,686,401    | 5,110,074          | 18,190                        | 164,141            | 349                           | 1,063,874        | 120,024          | 219,749                                   |
| South Atlantic division:           |              |                    |                               |                    |                               |                  |                  |                                           |
| Maryland.....                      | 2,914,439    | 2,871,656          | 21,969                        | 500                | 4,476                         | 8,838            | .....            | 7,000                                     |
| North Central division:            |              |                    |                               |                    |                               |                  |                  |                                           |
| Illinois.....                      | 7,900,051    | 7,578,177          | 46,510                        | 1,514              | 180,245                       | 40,026           | 4,400            | 49,179                                    |
| Michigan.....                      | 3,761,219    | 1,103,413          | 59,844                        | 193,070            | 1,146,159                     | 997,270          | 20,500           | 240,963                                   |
| Minnesota.....                     | 2,632,701    | 264,729            | 12,044                        | 1,549,551          | .....                         | 785,583          | 7,414            | 13,380                                    |
| Ohio.....                          | 3,572,162    | 3,475,463          | 47,892                        | .....              | 1,200                         | 17,717           | 28,911           | 979                                       |
| South Central division:            |              |                    |                               |                    |                               |                  |                  |                                           |
| Texas.....                         | 1,616,022    | 1,362,268          | 129,220                       | .....              | .....                         | 39,723           | 84,361           | 450                                       |
| Western division:                  |              |                    |                               |                    |                               |                  |                  |                                           |
| California.....                    | 8,849,652    | 1,876,787          | 20,000                        | 1,914,801          | 1,200                         | 4,851,493        | .....            | 185,371                                   |
| Colorado.....                      | 2,008,800    | 1,582,290          | .....                         | 339,790            | 26,996                        | 26,121           | 20,744           | 9,859                                     |
| Oregon.....                        | 1,657,903    | .....              | .....                         | 116,951            | .....                         | 1,889,400        | 800              | 21,457                                    |
| Washington.....                    | 2,444,556    | 114,466            | .....                         | 143,563            | 264,916                       | 241,899          | .....            | 1,679,722                                 |

There were 96 stations reported as under construction during the year 1907, which were not in actual operation before the close of the year. These stations properly form a part of the new construction, but the statistics for them are shown separately from those for the plants that were in operation during a portion or all of the year. In presenting these statistics it should be understood that although an earnest effort was made to obtain accurate information, both through the special agents in the field and by correspondence, the canvass was not so careful and thorough for this class of stations as for those in operation; some may therefore have been overlooked.

TABLE 80.—Number of stations under construction, December 31, 1907, by character of ownership and by geographic divisions.

| DIVISION.           | Ag-gre-gate. | STATIONS WHICH REPORTED COST TO DATE. |             |       |                       | STATIONS WHICH DID NOT REPORT COST TO DATE. |                       |            |
|---------------------|--------------|---------------------------------------|-------------|-------|-----------------------|---------------------------------------------|-----------------------|------------|
|                     |              | Total.                                | Individual. | Firm. | Incorporated company. | Total.                                      | Incorporated company. | Municipal. |
| United States.....  | 96           | 86                                    | 11          | 7     | 54                    | 14                                          | 10                    | 9          |
| North Atlantic..... | 21           | 18                                    | 3           | 1     | 14                    | .....                                       | 3                     | 3          |
| South Atlantic..... | 19           | 17                                    | .....       | ..... | 10                    | 7                                           | 2                     | 1          |
| North Central.....  | 24           | 23                                    | 4           | 4     | 10                    | 5                                           | 1                     | 1          |
| South Central.....  | 12           | 12                                    | 3           | 1     | 6                     | 2                                           | .....                 | .....      |
| Western.....        | 20           | 16                                    | 1           | 1     | 14                    | .....                                       | 4                     | .....      |

Of the 96 stations under construction, 86 reported the amount expended on them to December 31, 1907, and 10 claimed to be unable to answer the inquiry. The number of stations is divided among the several geographic divisions in a manner which clearly indicates that, although the expenditure for construction and the capitalization may vary largely in the geographic divisions, the construction of new stations, regardless of size, is confined to no special section, but is general throughout the country.

TABLE 81.—Cost of construction and equipment of stations under construction, December 31, 1907, and capitalization of the incorporated companies, by character of ownership and by geographic divisions.

| DIVISION AND CHARACTER OF OWNERSHIP. | Number of stations. | Cost of construction and equipment to December 31, 1907. <sup>1</sup> | Authorized capitalization of the incorporated companies. |
|--------------------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------------------------------|
| United States.....                   | 96                  | \$28,413,013                                                          | \$155,615,400                                            |
| Individual.....                      | 11                  | 70,740                                                                | .....                                                    |
| Firm.....                            | 7                   | 60,904                                                                | .....                                                    |
| Incorporated company.....            | 63                  | 25,025,028                                                            | 155,615,400                                              |
| Municipal.....                       | 15                  | 3,256,341                                                             | .....                                                    |
| North Atlantic.....                  | 21                  | 1,788,223                                                             | 7,570,000                                                |
| Individual.....                      | 3                   | 26,040                                                                | .....                                                    |
| Firm.....                            | 1                   | 2,000                                                                 | .....                                                    |
| Incorporated company.....            | 17                  | 1,760,183                                                             | 7,570,000                                                |
| South Atlantic.....                  | 19                  | 7,758,175                                                             | 29,775,000                                               |
| Incorporated company.....            | 11                  | 7,610,634                                                             | 29,775,000                                               |
| Municipal.....                       | 8                   | 147,541                                                               | .....                                                    |
| North Central.....                   | 24                  | 5,197,828                                                             | 9,632,000                                                |
| Individual.....                      | 4                   | 26,400                                                                | .....                                                    |
| Firm.....                            | 4                   | 16,904                                                                | .....                                                    |
| Incorporated company.....            | 11                  | 2,087,724                                                             | 9,632,000                                                |
| Municipal.....                       | 5                   | 3,066,800                                                             | .....                                                    |
| South Central.....                   | 12                  | 245,535                                                               | 860,400                                                  |
| Individual.....                      | 3                   | 12,500                                                                | .....                                                    |
| Firm.....                            | 1                   | 12,000                                                                | .....                                                    |
| Incorporated company.....            | 6                   | 179,035                                                               | 860,400                                                  |
| Municipal.....                       | 2                   | 42,000                                                                | .....                                                    |
| Western.....                         | 20                  | 13,423,252                                                            | 107,778,000                                              |
| Individual.....                      | 1                   | 5,800                                                                 | .....                                                    |
| Firm.....                            | 1                   | 30,000                                                                | .....                                                    |
| Incorporated company.....            | 18                  | 13,387,452                                                            | 107,778,000                                              |

<sup>1</sup> Ten of the 96 stations failed to report the cost of construction.

Combining the cost of the stations that were under construction at the close of the year and the cost of the new equipment, extensions, etc., of operating stations gives a total of \$129,325,586 as the total cost of new work during 1907. Incorporated companies owned the majority of the new stations, and their authorized capitalization, which amounted to \$155,615,400, is presented merely as some indication of the magnitude

of the new enterprises that were in progress or projected but had not been completed by December 31, 1907.

TABLE 82.—Cost of construction and equipment of stations under construction, December 31, 1907, and capitalization of the incorporated companies, by kind of power used and by geographic divisions.

| DIVISION AND KIND OF POWER. | Number of stations. | Cost of construction and equipment to December 31, 1907. <sup>1</sup> | Authorized capitalization of the incorporated companies. |
|-----------------------------|---------------------|-----------------------------------------------------------------------|----------------------------------------------------------|
| United States .....         | 96                  | \$28,413,013                                                          | \$155,615,400                                            |
| Water <sup>2</sup> .....    | 44                  | 27,500,716                                                            | 153,654,000                                              |
| Steam .....                 | 39                  | 790,172                                                               | 1,636,000                                                |
| Gas .....                   | 10                  | 46,204                                                                | 75,400                                                   |
| No power equipment .....    | 3                   | 75,921                                                                | 250,000                                                  |
| North Atlantic .....        | 21                  | 1,788,223                                                             | 7,570,000                                                |
| Water <sup>2</sup> .....    | 13                  | 1,583,830                                                             | 6,779,000                                                |
| Steam .....                 | 4                   | 135,922                                                               | 541,000                                                  |
| Gas .....                   | 2                   | 5,800                                                                 | 25,000                                                   |
| No power equipment .....    | 2                   | 62,671                                                                | 225,000                                                  |
| South Atlantic .....        | 19                  | 7,758,175                                                             | 29,775,000                                               |
| Water .....                 | 9                   | 7,572,134                                                             | 29,730,000                                               |
| Steam .....                 | 10                  | 186,041                                                               | 45,000                                                   |
| North Central .....         | 24                  | 5,197,828                                                             | 9,632,000                                                |
| Water .....                 | 5                   | 5,016,000                                                             | 9,350,000                                                |
| Steam .....                 | 13                  | 144,824                                                               | 232,000                                                  |
| Gas .....                   | 6                   | 37,004                                                                | 50,000                                                   |
| South Central .....         | 12                  | 245,535                                                               | 860,400                                                  |
| Water .....                 | 1                   | 15,000                                                                | 125,000                                                  |
| Steam .....                 | 9                   | 227,135                                                               | 735,000                                                  |
| Gas .....                   | 2                   | 3,400                                                                 | 400                                                      |
| Western .....               | 20                  | 13,423,252                                                            | 107,778,000                                              |
| Water .....                 | 16                  | 13,313,752                                                            | 107,670,000                                              |
| Steam .....                 | 3                   | 96,250                                                                | 83,000                                                   |
| No power equipment .....    | 1                   | 13,250                                                                | 25,000                                                   |

<sup>1</sup> Ten of the 96 stations failed to report the cost of construction.

<sup>2</sup> Includes 2 stations having steam power also.

The bulk of the expenditure for new construction was reported for stations to be operated by water power, 96.8 per cent of the total being for plants of

that character, and although classed as electric stations there is little doubt that many of them are being built primarily for the generation of electrical energy which, by means of transmission lines, will be delivered in bulk to other places from which it will be distributed for actual use. The percentages reported for the remaining stations by character of primary power were as follows: Steam, 2.8 per cent; gas, two-tenths of 1 per cent; and those not to be supplied with power equipment, three-tenths of 1 per cent.

Of the 63 incorporated companies, 9 did not report the cost of construction. The Western division reported 48.4 per cent of the total cost for water-power stations under construction. The South Atlantic division was second in the construction of water-power stations, with 27.5 per cent of the total cost of construction; the North Central, third, with 18.2 per cent; the North Atlantic, fourth, with 5.8 per cent; and the South Central last, with one-tenth of 1 per cent of the total cost of construction for stations which were to use water power.

The following statement shows the character of ownership of the stations under construction, by kind of power:

Stations under construction, December 31, 1907—Number of stations, by kind of power and by character of ownership.

| CHARACTER OF OWNERSHIP. | Total. | Water. <sup>1</sup> | Steam. | Gas. | No power equipment. |
|-------------------------|--------|---------------------|--------|------|---------------------|
| Total .....             | 96     | 44                  | 39     | 10   | 3                   |
| Individual .....        | 11     | 4                   | 4      | 3    | —                   |
| Firm .....              | 7      | 2                   | 3      | 2    | —                   |
| Corporation .....       | 63     | 37                  | 18     | 5    | 3                   |
| Municipal .....         | 15     | 1                   | 14     | —    | —                   |

<sup>1</sup> Includes 2 stations having steam power also.

## CHAPTER VII.

### INCOME AND EXPENSES.

*Purpose of the statistics.*—The object in view in securing these statistics concerning income and expenses was to show the magnitude of the industry and to bring out certain of its important features. No attempt was made to secure figures from which the profits or losses on the year's business might be determined, as it was well understood that conclusions on this point could not properly be drawn from information which failed to take into consideration bad debts, discounts, depreciation, and perhaps other important matters of a similar character. As has already been explained, a small part of the income as given in this report does not represent cash receipts or actual receipts of any character, since in the case of municipal plants the estimated value of the current furnished for the municipality was classed as income, and similar estimates were made by the commercial stations for the value of the current supplied as free service.

In 1902 there were 380 commercial stations which furnished some service or paid a cash compensation in the character of a tax to the municipalities in which they were located. The value of the free service was estimated at \$150,809 and the cash compensation was \$199,423, making a total of \$350,232. In 1907 the inquiry as to compensation for franchise was abandoned, and in its stead the estimated value of current furnished free was called for. For the year last

named, 727 commercial companies reported free service, the value of which was estimated at \$337,810. If to this amount is added the estimated value of the current furnished by the municipal stations for the use of the municipality, \$5,672,785, a total of \$6,010,595 was classed as income which does not represent actual receipts.

#### GENERAL STATISTICS OF INCOME.

Although most of the income, 96.6 per cent, was derived from the sale of current, a small proportion, 3.4 per cent, was obtained from the sale of supplies and fixtures and from sundry miscellaneous sources. So far as possible, the income from the sale of supplies and fixtures was omitted from the reports, and is included only when such sales were so involved with the general business of the station that they could not be satisfactorily segregated. The income from miscellaneous sources includes such items as income from steam heating, pumping, steam or water power, rentals of machines, etc., wiring of houses and work of a kindred character, interest on deposits, etc. The details pertaining to income will be taken up in the tables which follow.

The chief items of income for commercial and municipal stations are shown in Table 83.

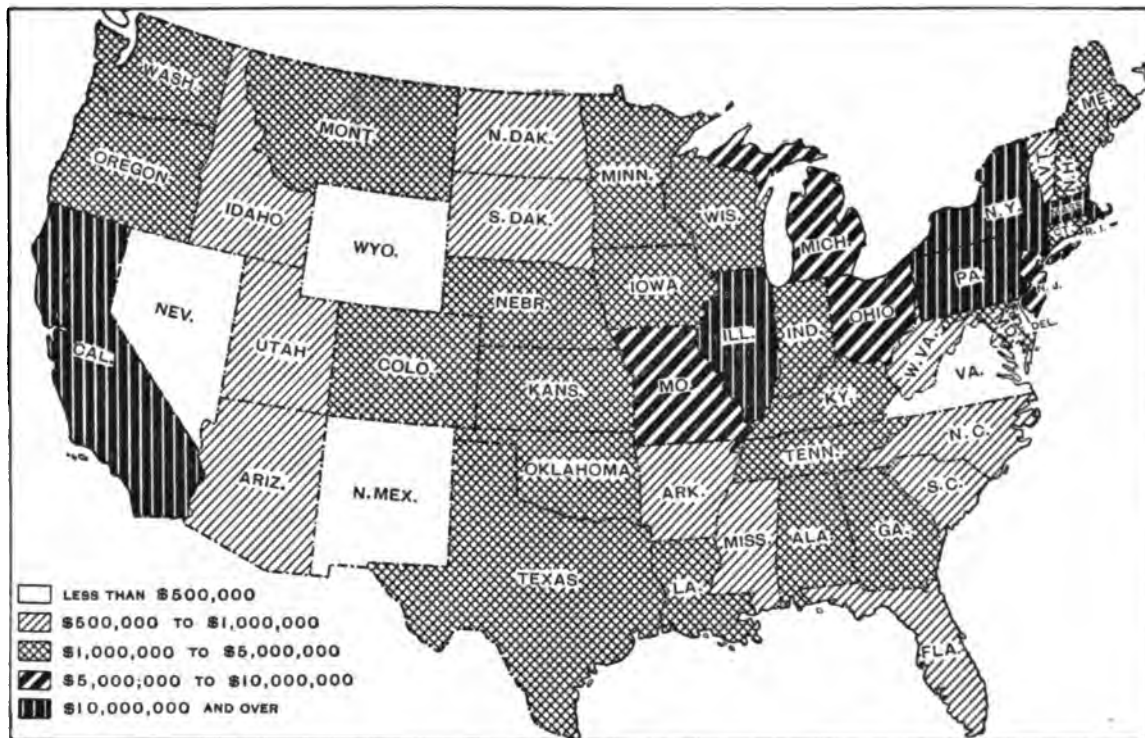
TABLE 83.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME: 1907 AND 1902.

|                         | Census.      | Total.                      | Commercial.                 | Municipal.                | PER CENT OF TOTAL. |                 | PER CENT OF INCREASE. |                  |                 |
|-------------------------|--------------|-----------------------------|-----------------------------|---------------------------|--------------------|-----------------|-----------------------|------------------|-----------------|
|                         |              |                             |                             |                           | Commer-<br>cial.   | Munici-<br>pal. | Total.                | Commer-<br>cial. | Munici-<br>pal. |
| Number of stations..... | 1907<br>1902 | 4,714<br>3,620              | 3,462<br>2,805              | 1,252<br>815              | 73.4<br>77.5       | 26.6<br>22.5    | 30.2                  | 23.4             | 53.6            |
| Gross income.....       | 1907<br>1902 | \$175,642,338<br>85,700,605 | \$161,630,339<br>78,735,500 | \$14,011,999<br>6,965,105 | 92.0<br>91.9       | 8.0<br>8.1      | 105.0                 | 105.3            | 101.2           |
| Electric service.....   | 1907<br>1902 | 169,614,691<br>84,186,605   | 156,000,257<br>77,349,749   | 13,614,434<br>6,836,856   | 92.0<br>91.9       | 8.0<br>8.1      | 101.5                 | 101.7            | 99.1            |
| Lighting.....           | 1907<br>1902 | 125,755,114<br>70,138,147   | 112,714,851<br>63,389,284   | 13,040,263<br>6,748,863   | 89.6<br>90.4       | 10.4<br>9.6     | 79.3                  | 77.8             | 93.2            |
| Stationary motors.....  | 1907<br>1902 | 28,511,550<br>9,910,217     | 27,995,177<br>9,839,677     | 516,373<br>70,540         | 96.2<br>99.3       | 1.8<br>0.7      | 187.7                 | 184.5            | 632.0           |
| All other.....          | 1907<br>1902 | 15,348,027<br>4,138,241     | 15,290,229<br>4,120,788     | 57,798<br>17,453          | 99.6<br>99.6       | 0.4<br>0.4      | 270.9                 | 271.1            | 231.2           |
| All other sources.....  | 1907<br>1902 | 6,027,647<br>1,514,000      | 5,630,082<br>1,385,751      | 397,565<br>128,249        | 93.4<br>91.5       | 6.6<br>8.5      | 298.1                 | 306.3            | 210.0           |

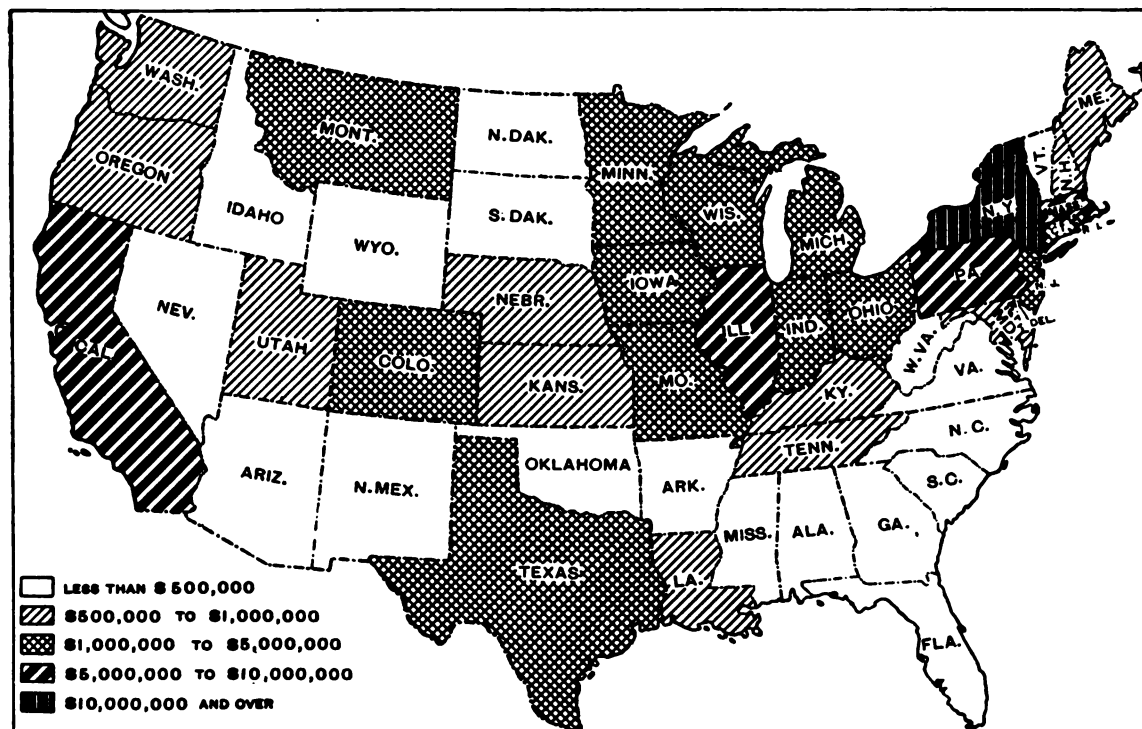
Of the different classes of income, that from lighting shows the largest actual amount, although measured by its percentage of increase it was the smallest. The earlier work of the central stations was chiefly in the

direction of lighting, which as a consequence was highly developed in 1902; while stationary-motor service and, to a still greater extent, the sale of current for miscellaneous purposes are of later development.

MAP 2.—CENTRAL ELECTRIC STATIONS—GROSS INCOME: 1907.



MAP 3.—CENTRAL ELECTRIC STATIONS—GROSS INCOME: 1902.



Although the municipal stations formed nearly 27 per cent of the total number of central stations, their proportion of the total income was only 8 per cent. The business of the municipal stations is practically confined to electric lighting. The income of these stations from stationary-motor service was less than 2 per cent of the total for that item for all stations, while the income from all other electric service, which embraces current sold to other electric companies and to railways, for charging automobiles, etc., was insignificant, forming less than one-half of 1 per cent of the total for this item.

The per cent distribution of the gross income for commercial and municipal stations is shown in Table 84.

It is apparent from the table that a considerable change has taken place in the relative importance of the various classes of income from electric service. The percentage that the income from lighting forms of the total income shows a decrease of 10.2, while the proportions for income from stationary-motor service and all other electric service, and from all other sources, increased considerably.

TABLE 84.—Commercial and municipal central electric stations—  
Per cent distribution of gross income: 1907 and 1902.

|                        | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|------------------------|--------|-------|-------------|-------|------------|-------|
|                        | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Gross income.....      | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Electric service.....  | 96.6   | 98.2  | 96.5        | 98.2  | 97.2       | 98.2  |
| Lighting.....          | 71.6   | 81.8  | 69.7        | 80.5  | 93.1       | 96.9  |
| Stationary motors..... | 16.2   | 11.6  | 17.3        | 12.5  | 3.7        | 1.0   |
| All other.....         | 8.7    | 4.8   | 9.5         | 5.2   | 0.4        | 0.3   |
| All other sources..... | 3.4    | 1.8   | 3.5         | 1.8   | 2.8        | 1.8   |

In some instances there is no real difference between the character of service performed by the purely electric stations, or those engaged only in the generation or sale of electricity, or both, and the composite stations, which embrace those also engaged in some other business; but in view of the fact that in many instances the electric branch of the industry for the latter class of stations was only incident to another pursuit, they have been given a separate presentation in various tables of this report. The income for the purely electric and the composite stations is shown in Table 85.

TABLE 85.—PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—GROSS INCOME: 1907 AND 1902

|                         | Census.      | Total.                      | Purely electric.            | Composite.                 | PER CENT OF TOTAL. |              | PER CENT OF INCREASE. |                  |            |
|-------------------------|--------------|-----------------------------|-----------------------------|----------------------------|--------------------|--------------|-----------------------|------------------|------------|
|                         |              |                             |                             |                            | Purely electric.   | Composite.   | Total.                | Purely electric. | Composite. |
| Number of stations..... | 1907<br>1902 | 4,714<br>3,620              | 2,648<br>2,139              | 2,066<br>1,481             | 56.2<br>59.1       | 43.8<br>40.9 | 30.2                  | 23.8             | 39.5       |
| Gross income.....       | 1907<br>1902 | \$175,642,338<br>85,700,605 | \$107,974,921<br>58,603,406 | \$67,667,417<br>27,097,199 | 61.5<br>68.4       | 38.5<br>31.6 | 105.0                 | 84.2             | 140.7      |
| Electric service.....   | 1907<br>1902 | 160,614,691<br>84,186,605   | 104,629,574<br>57,470,597   | 64,985,117<br>26,716,008   | 61.7<br>68.3       | 38.3<br>31.7 | 101.5                 | 82.1             | 143.2      |
| Lighting.....           | 1907<br>1902 | 125,755,114<br>70,138,147   | 75,678,052<br>46,812,428    | 50,077,062<br>23,325,719   | 60.2<br>66.7       | 39.8<br>33.3 | 79.3                  | 61.7             | 114.7      |
| Stationary motors.....  | 1907<br>1902 | 28,511,550<br>9,910,217     | 18,213,001<br>7,100,519     | 10,298,549<br>2,809,698    | 63.9<br>71.6       | 36.1<br>28.8 | 187.7                 | 156.5            | 266.5      |
| All other.....          | 1907<br>1902 | 15,348,027<br>4,138,241     | 10,738,521<br>3,557,650     | 4,609,506<br>580,591       | 70.0<br>86.0       | 30.0<br>14.0 | 270.9                 | 201.8            | 604.0      |
| All other sources.....  | 1907<br>1902 | 6,027,047<br>1,514,000      | 3,345,347<br>1,132,809      | 2,682,300<br>381,191       | 55.5<br>74.8       | 44.5<br>25.2 | 298.1                 | 195.3            | 603.7      |

That the character of the electric service of these two classes of stations taken as a whole is becoming more uniform is evidenced by the absence in 1907 of the wide divergence, so noticeable in 1902, in the proportions of the several items of income credited to each. Both in 1907 and in 1902 the composite stations showed their largest proportion of the income from electric service for lighting, and their smallest for all other electric service; but while the difference in the percentage of these two classes of income which was credited to composite stations was 19.3 in 1902, it was only 9.8 in 1907.

The actual increases for all classes of income from electric service and for the gross income were greater for the purely electric stations, while the composite stations showed a slightly larger actual gain in the income from "all other sources." The percentages of increase, however, are in every case greater for the composite stations, so that the proportions of the different classes of income shown for this class of stations were considerably greater in 1907 than in 1902.

The per cent distribution of the gross income for purely electric and composite stations is shown in Table 86.



TABLE 86.—Purely electric and composite central electric stations—  
Per cent distribution of gross income: 1907 and 1902.

|                        | TOTAL. |       | PURELY ELECTRIC. |       | COMPOSITE. |       |
|------------------------|--------|-------|------------------|-------|------------|-------|
|                        | 1907   | 1902  | 1907             | 1902  | 1907       | 1902  |
| Gross income.....      | 100.0  | 100.0 | 100.0            | 100.0 | 100.0      | 100.0 |
| Electric service.....  | 96.6   | 98.2  | 96.9             | 98.1  | 96.0       | 98.6  |
| Lighting.....          | 71.6   | 81.8  | 70.1             | 79.9  | 74.0       | 86.1  |
| Stationary motors..... | 16.2   | 11.6  | 16.9             | 12.1  | 15.2       | 10.4  |
| All other.....         | 8.7    | 4.8   | 9.9              | 6.1   | 6.8        | 2.1   |
| All other sources..... | 3.4    | 1.8   | 3.1              | 1.9   | 4.0        | 1.4   |

In 1907 the purely electric stations constituted a smaller proportion of the total number of establishments than in 1902, and also contributed a smaller percentage of the gross income. Table 86 shows that of the total income from electric service, the percentage of income from lighting for the purely electric stations was smaller in 1907 than in 1902, but slightly greater for the income from stationary-motor service, "All other electric service," and "All other sources."

The gross income will be presented by dynamo capacity of the stations in several tables which follow.

TABLE 87.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                      | Under 200 kilowatts.       | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. <sup>1</sup> | 5,000 kilowatts and over.  | Stations having no generating equipment. |
|-------------------------|--------------|-----------------------------|----------------------------|------------------------------|--------------------------------|----------------------------------|-----------------------------------------------|----------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 4,714<br>3,620              | 3,038<br>2,587             | 821<br>586                   | 269<br>172                     | 169<br>96                        | 116<br>67                                     | 74<br>32                   | 227<br>78                                |
| Gross income.....       | 1907<br>1902 | \$175,642,338<br>85,700,605 | \$17,140,070<br>14,440,351 | \$14,786,719<br>10,409,319   | \$10,465,110<br>7,001,486      | \$13,149,808<br>8,414,307        | \$21,915,199<br>13,839,846                    | \$89,930,073<br>30,027,061 | \$8,255,359<br>1,568,235                 |
| Electric service.....   | 1907<br>1902 | 169,614,691<br>84,186,605   | 16,344,745<br>14,090,189   | 13,954,088<br>10,122,092     | 10,075,476<br>6,896,143        | 12,617,855<br>8,175,941          | 21,277,402<br>13,635,206                      | 87,277,832<br>29,756,206   | 8,067,293<br>1,510,828                   |
| Lighting.....           | 1907<br>1902 | 125,755,114<br>70,138,147   | 15,779,128<br>13,741,455   | 12,547,375<br>9,317,862      | 8,267,158<br>5,832,733         | 9,274,623<br>6,385,817           | 15,355,491<br>10,875,989                      | 58,957,999<br>22,964,304   | 5,573,340<br>1,019,967                   |
| Stationary motors.....  | 1907<br>1902 | 28,511,550<br>9,910,217     | 386,329<br>228,578         | 1,094,952<br>598,897         | 1,240,926<br>682,445           | 2,190,200<br>1,263,138           | 4,353,295<br>2,064,955                        | 17,621,398<br>4,824,518    | 1,624,400<br>277,686                     |
| All other.....          | 1907<br>1902 | 15,348,027<br>4,138,241     | 179,288<br>120,156         | 311,761<br>205,333           | 567,392<br>380,965             | 1,153,032<br>526,986             | 1,568,616<br>724,262                          | 10,096,445<br>1,967,384    | 899,403<br>213,155                       |
| All other sources.....  | 1907<br>1902 | 6,027,647<br>1,514,000      | 795,325<br>350,162         | 832,631<br>287,227           | 389,634<br>105,343             | 531,953<br>238,366               | 637,797<br>204,640                            | 2,652,241<br>270,855       | 188,066<br>57,407                        |

<sup>1</sup> Includes 1 municipal station with a kilowatt capacity of 5,000 or over.

Of the six classes of stations grouped according to dynamo capacity, the largest income is shown for the class smallest in numbers, stations having a kilowatt capacity of 5,000 or over. In 1907 more than one-half of the total income was reported by this class, which naturally embraces the stations in the large cities. The next largest income is shown for the next lower group by kilowatt capacity and the next higher in number of stations; but the group ranking third in the amount of income reported is that which comprises the stations of smallest dynamo capacity, which, however, includes nearly two-thirds of the total number of stations. Almost 5 per cent of the total income was reported by stations not equipped with generating apparatus. The proportions of the total income from lighting reported for the different classes of stations vary but little from the corresponding proportions of total income, but in the case of income from stationary-motor service and all other electric service the proportions show decided variations. This results from the fact that the income from each of these two classes of service increases as the dynamo capacity of the stations grows larger. In 1907 the smallest stations, those with a dynamo capacity of less than 200

kilowatts, reported but 1.4 per cent of the total income for motor service, while the stations of largest dynamo capacity reported 61.8 per cent. In the case of income from all other electric service the corresponding proportions were 1.2 per cent and 69.7 per cent. From this it is clear that the business of the small stations is almost exclusively confined to lighting, while the larger stations are, to a considerable extent, engaged in performing other services.

There is a marked difference between the commercial and the municipal stations in respect to the proportions of income reported by large and small plants. While the commercial stations show their largest proportions for the two classes of highest individual capacity, the municipal stations show their largest proportions for the two of lowest individual capacity. The gross income for the class of smallest dynamo capacity for municipal stations represented more than one-third of the total, while that for the class of next higher dynamo capacity was nearly as much as the total for all the remaining classes. The two classes together reported 67.6 per cent of the total income and 92.6 per cent of the total number of stations.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 88.—COMMERCIAL CENTRAL ELECTRIC STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                      | Under 200 kilowatts.       | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. | 5,000 kilowatts and over.  | Stations having no generating equipment. |
|-------------------------|--------------|-----------------------------|----------------------------|------------------------------|--------------------------------|----------------------------------|----------------------------------|----------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 3,462<br>2,805              | 2,116<br>1,890             | 584<br>497                   | 225<br>160                     | 159<br>92                        | 111<br>64                        | 74<br>32                   | 193<br>70                                |
| Gross income.....       | 1907<br>1902 | \$161,630,339<br>78,735,500 | \$11,725,245<br>10,582,929 | \$10,727,632<br>8,980,913    | \$8,903,772<br>6,688,819       | \$12,077,872<br>7,922,180        | \$20,568,767<br>13,107,024       | \$89,930,073<br>30,027,061 | \$7,696,978<br>1,426,574                 |
| Electric service.....   | 1907<br>1902 | 156,000,257<br>77,349,749   | 11,117,146<br>10,309,190   | 10,036,132<br>8,725,433      | 8,539,111<br>6,589,544         | 11,554,325<br>7,683,814          | 19,949,795<br>12,915,920         | 87,277,832<br>29,756,206   | 7,525,916<br>1,399,642                   |
| Lighting.....           | 1907<br>1902 | 112,714,851<br>63,389,284   | 10,621,562<br>9,982,266    | 8,837,815<br>7,952,863       | 6,845,383<br>5,533,734         | 8,328,039<br>5,908,006           | 14,070,217<br>10,156,539         | 58,957,999<br>22,964,304   | 5,053,836<br>884,282                     |
| Stationary motors.....  | 1907<br>1902 | 27,995,177<br>9,539,777     | 331,416<br>210,925         | 908,089<br>569,963           | 1,140,919<br>675,525           | 2,076,288<br>1,251,822           | 4,313,891<br>2,034,819           | 17,621,388<br>4,824,618    | 1,603,186<br>272,206                     |
| All other.....          | 1907<br>1902 | 15,290,229<br>4,120,788     | 164,168<br>105,999         | 290,228<br>202,717           | 552,809<br>380,285             | 1,149,998<br>526,986             | 1,565,687<br>724,262             | 10,698,445<br>1,967,384    | 868,894<br>213,155                       |
| All other sources.....  | 1907<br>1902 | 5,620,062<br>1,386,751      | 608,069<br>273,739         | 691,500<br>255,480           | 364,661<br>99,275              | 523,547<br>238,366               | 618,972<br>191,104               | 2,652,241<br>270,855       | 171,062<br>56,932                        |

TABLE 89.—MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                    | Under 200 kilowatts.     | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. <sup>1</sup> | Stations having no generating equipment. |
|-------------------------|--------------|---------------------------|--------------------------|------------------------------|--------------------------------|----------------------------------|-----------------------------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 1,252<br>815              | 922<br>697               | 237<br>89                    | 44<br>12                       | 10<br>6                          | 5<br>3                                        | 34<br>8                                  |
| Gross income.....       | 1907<br>1902 | \$14,011,999<br>6,965,105 | \$5,414,825<br>3,857,422 | \$4,059,087<br>1,428,406     | \$1,561,338<br>312,667         | \$1,071,936<br>492,127           | \$1,346,432<br>732,822                        | \$558,381<br>141,661                     |
| Electric service.....   | 1907<br>1902 | 13,614,434<br>6,836,556   | 5,227,599<br>3,780,999   | 3,917,956<br>1,396,659       | 1,536,365<br>306,599           | 1,063,530<br>492,127             | 1,327,607<br>719,286                          | 541,377<br>141,186                       |
| Lighting.....           | 1907<br>1902 | 13,040,263<br>6,748,863   | 5,157,566<br>3,749,189   | 3,709,560<br>1,365,009       | 1,421,775<br>296,999           | 946,584<br>480,811               | 1,285,274<br>719,150                          | 519,504<br>135,706                       |
| Stationary motors.....  | 1907<br>1902 | 516,373<br>70,540         | 54,913<br>17,653         | 186,863<br>29,034            | 100,007<br>6,920               | 113,912<br>11,316                | 39,404<br>136                                 | 21,274<br>5,481                          |
| All other.....          | 1907<br>1902 | 57,798<br>17,453          | 15,120<br>14,157         | 21,533<br>2,616              | 14,583<br>680                  | 3,034                            | 2,929                                         | 599                                      |
| All other sources.....  | 1907<br>1902 | 397,565<br>128,249        | 187,226<br>76,423        | 141,131<br>31,747            | 24,973<br>6,068                | 8,406                            | 18,825<br>13,536                              | 17,004<br>475                            |

<sup>1</sup> Includes 1 station having a capacity of more than 5,000 kilowatts.

By a reference to Tables 90 and 91 it will be seen that the proportions of the total income of the purely electric and the composite commercial stations reported for the different groups according to dynamo capacity are similar to those shown for the two classes combined. The same may be said of the proportions shown for the purely electric and the composite

municipal stations as compared with those shown for all municipal stations. It is noteworthy that in 1907 the stations of smallest dynamo capacity reported a smaller proportion of the total income both of the purely electric and of the composite municipal stations than in 1902.

TABLE 90.—PURELY ELECTRIC COMMERCIAL STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                      | Under 200 kilowatts.     | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. | 5,000 kilowatts and over.  | Stations having no generating equipment. |
|-------------------------|--------------|-----------------------------|--------------------------|------------------------------|--------------------------------|----------------------------------|----------------------------------|----------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 2,127<br>1,759              | 1,314<br>1,176           | 350<br>311                   | 114<br>86                      | 76<br>65                         | 66<br>46                         | 47<br>22                   | 160<br>53                                |
| Gross income.....       | 1907<br>1902 | \$101,222,267<br>54,455,737 | \$7,506,219<br>6,085,183 | \$5,994,937<br>5,315,200     | \$3,874,663<br>3,239,659       | \$5,221,022<br>5,525,615         | \$12,820,831<br>10,003,345       | \$59,664,130<br>22,625,474 | \$6,140,465<br>1,051,261                 |
| Electric service.....   | 1907<br>1902 | 98,056,838<br>53,394,158    | 7,107,234<br>6,504,590   | 5,634,988<br>5,127,766       | 3,751,269<br>3,183,899         | 4,952,687<br>5,352,780           | 12,582,827<br>9,831,193          | 58,006,040<br>22,387,101   | 6,021,793<br>1,006,829                   |
| Lighting.....           | 1907<br>1902 | 69,383,375<br>42,804,000    | 6,777,126<br>6,354,594   | 5,009,071<br>4,665,079       | 2,973,428<br>2,575,351         | 3,261,487<br>4,036,559           | 8,930,737<br>7,611,473           | 38,845,455<br>16,996,183   | 3,866,071<br>564,761                     |
| Stationary motors.....  | 1907<br>1902 | 17,951,940<br>7,049,444     | 211,841<br>88,188        | 465,406<br>354,540           | 470,393<br>337,603             | 1,002,524<br>907,706             | 3,064,162<br>1,553,371           | 11,421,189<br>3,579,123    | 1,316,425<br>228,913                     |
| All other.....          | 1907<br>1902 | 10,721,523<br>3,640,714     | 118,267<br>61,808        | 580,511<br>108,147           | 307,448<br>270,945             | 668,676<br>408,515               | 887,928<br>666,349               | 7,739,396<br>1,811,795     | 839,297<br>213,155                       |
| All other sources.....  | 1907<br>1902 | 3,165,429<br>1,061,579      | 398,985<br>190,593       | 359,949<br>187,434           | 123,394<br>55,760              | 268,335<br>172,835               | 238,004<br>172,152               | 1,658,090<br>238,373       | 118,672<br>44,432                        |

# INCOME AND EXPENSES.

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TABLE 91.—COMPOSITE COMMERCIAL STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                     | Under 200 kilowatts.     | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. | 5,000 kilowatts and over. | Stations having no generating equipment. |
|-------------------------|--------------|----------------------------|--------------------------|------------------------------|--------------------------------|----------------------------------|----------------------------------|---------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 1,335<br>1,046             | 802<br>714               | 234<br>186                   | 111<br>74                      | 83<br>27                         | 45<br>18                         | 27<br>10                  | 33<br>17                                 |
| Gross income.....       | 1907<br>1902 | \$60,408,072<br>24,279,763 | \$4,219,026<br>3,887,746 | \$4,732,665<br>3,665,713     | \$5,029,109<br>3,446,160       | \$6,856,850<br>2,396,565         | \$7,747,936<br>3,108,679         | \$30,265,943<br>7,401,587 | \$1,556,513<br>375,313                   |
| Electric service.....   | 1907<br>1902 | 57,943,419<br>23,955,591   | 4,009,912<br>3,804,600   | 4,401,144<br>3,567,667       | 4,787,842<br>3,406,645         | 6,601,638<br>2,331,034           | 7,366,966<br>3,084,727           | 29,271,792<br>7,369,105   | 1,504,123<br>362,813                     |
| Lighting.....           | 1907<br>1902 | 43,331,476<br>20,585,284   | 3,844,436<br>3,637,672   | 3,828,744<br>3,287,774       | 3,571,955<br>2,958,383         | 5,046,552<br>1,868,447           | 5,439,480<br>2,545,366           | 20,112,544<br>5,968,121   | 1,187,765<br>319,521                     |
| Stationary motors.....  | 1907<br>1902 | 10,043,237<br>2,790,283    | 119,575<br>122,737       | 442,683<br>215,323           | 670,526<br>337,922             | 1,073,764<br>344,116             | 1,249,729<br>481,448             | 6,200,199<br>1,245,365    | 286,761<br>43,292                        |
| All other.....          | 1907<br>1902 | 4,568,706<br>580,074       | 45,901<br>44,191         | 129,717<br>94,570            | 245,361<br>106,340             | 481,322<br>118,471               | 677,759<br>57,913                | 2,959,049<br>155,589      | 29,597<br>.....                          |
| All other sources.....  | 1907<br>1902 | 2,464,653<br>324,172       | 209,114<br>83,146        | 331,551<br>68,046            | 241,267<br>43,515              | 255,212<br>65,531                | 380,968<br>18,952                | 994,151<br>32,482         | 52,390<br>12,500                         |

TABLE 92.—PURELY ELECTRIC MUNICIPAL STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                   | Under 200 kilowatts.     | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | 2,000 but under 5,000 kilowatts. <sup>1</sup> | Stations having no generating equipment. |
|-------------------------|--------------|--------------------------|--------------------------|------------------------------|--------------------------------|----------------------------------|-----------------------------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 521<br>380               | 378<br>301               | 86<br>55                     | 26<br>10                       | 4<br>4                           | 5<br>3                                        | 22<br>7                                  |
| Gross income.....       | 1907<br>1902 | \$6,782,654<br>4,147,669 | \$2,007,991<br>1,672,765 | \$1,589,617<br>921,067       | \$1,021,748<br>257,190         | \$336,861<br>423,822             | \$1,346,432<br>732,822                        | \$449,985<br>139,861                     |
| Electric service.....   | 1907<br>1902 | 6,572,736<br>4,076,439   | 1,936,132<br>1,644,044   | 1,525,810<br>897,580         | 1,004,526<br>252,179           | 335,928<br>423,964               | 1,327,007<br>719,286                          | 442,733<br>139,586                       |
| Lighting.....           | 1907<br>1902 | 6,284,677<br>4,006,428   | 1,917,550<br>1,622,891   | 1,432,399<br>896,765         | 925,765<br>244,679             | 304,592<br>418,138               | 1,285,274<br>719,160                          | 429,097<br>133,906                       |
| Stationary motors.....  | 1907<br>1902 | 261,061<br>51,075        | 16,269<br>7,513          | 90,379<br>25,199             | 70,948<br>6,920                | 31,000<br>5,826                  | 39,404<br>136                                 | 13,061<br>5,481                          |
| All other.....          | 1907<br>1902 | 16,998<br>16,936         | 2,313<br>13,640          | 3,032<br>2,616               | 7,813<br>680                   | 336<br>.....                     | 2,929<br>.....                                | 575<br>.....                             |
| All other sources.....  | 1907<br>1902 | 179,918<br>71,230        | 71,859<br>28,721         | 63,807<br>23,487             | 17,222<br>5,011                | 953<br>.....                     | 18,825<br>13,536                              | 7,252<br>475                             |

<sup>1</sup> Includes 1 station having a capacity of more than 5,000 kilowatts.

TABLE 93.—COMPOSITE MUNICIPAL STATIONS—GROSS INCOME, BY DYNAMO CAPACITY OF STATIONS: 1907 AND 1902.

|                         | Census.      | Total.                   | Under 200 kilowatts.     | 200 but under 500 kilowatts. | 500 but under 1,000 kilowatts. | 1,000 but under 2,000 kilowatts. | Stations having no generating equipment. |
|-------------------------|--------------|--------------------------|--------------------------|------------------------------|--------------------------------|----------------------------------|------------------------------------------|
| Number of stations..... | 1907<br>1902 | 731<br>435               | 544<br>396               | 151<br>34                    | 18<br>2                        | 6<br>2                           | 12<br>1                                  |
| Gross income.....       | 1907<br>1902 | \$7,259,345<br>2,817,436 | \$3,406,534<br>2,184,657 | \$2,469,470<br>507,339       | \$539,590<br>55,477            | \$735,055<br>68,163              | \$108,396<br>1,800                       |
| Electric service.....   | 1907<br>1902 | 7,041,698<br>2,760,417   | 3,291,467<br>2,136,955   | 2,392,146<br>499,079         | 531,839<br>54,420              | 727,602<br>68,163                | 98,644<br>1,800                          |
| Lighting.....           | 1907<br>1902 | 6,745,586<br>2,740,435   | 3,240,016<br>2,126,298   | 2,277,161<br>495,244         | 496,010<br>54,420              | 641,992<br>62,673                | 90,407<br>1,800                          |
| Stationary motors.....  | 1907<br>1902 | 255,312<br>19,465        | 38,644<br>10,140         | 96,484<br>3,835              | 29,069<br>.....                | 82,912<br>5,490                  | 8,213<br>.....                           |
| All other.....          | 1907<br>1902 | 40,800<br>517            | 12,807<br>617            | 18,501<br>.....              | 6,770<br>.....                 | 2,698<br>.....                   | 24<br>.....                              |
| All other sources.....  | 1907<br>1902 | 217,647<br>57,019        | 115,367<br>47,702        | 77,324<br>8,260              | 7,751<br>1,057                 | 7,453<br>.....                   | 9,782<br>.....                           |

The extent to which the income is confined to a few states is illustrated by showing the detailed income for the 10 selected states in Table 94.

At each of the two censuses almost 70 per cent of the gross income for all central stations was reported by the 10 states for which figures are given in Table 94, the proportion in 1907 and in 1902 varying but three-tenths of 1 per cent. Notwithstanding the large increases in the income for each state, there were several which in 1907 showed considerably decreased proportions of the total income reported, as follows:

Pennsylvania, from 11.1 per cent to 9.1 per cent; Massachusetts, from 7.4 per cent to 6.1 per cent; Ohio, from 5.2 per cent to 4.4 per cent; and New Jersey, from 4 per cent to 3.4 per cent. The states which increased their proportions were New York, Illinois, California, Michigan, and Missouri. California and Illinois show the most pronounced growth in the gross income, although the total actual increase for the 2 states combined was only \$54,759 more than the increase for New York alone.

TABLE 94.—CENTRAL ELECTRIC STATIONS—GROSS INCOME FOR 10 SELECTED STATES: 1907 AND 1902.

| STATE                             | Census.      | Number of stations. | Gross income.               | Lighting.                   | Stationary-motor service. | All other electric service. | All other sources.       |
|-----------------------------------|--------------|---------------------|-----------------------------|-----------------------------|---------------------------|-----------------------------|--------------------------|
| Total for United States.....      | 1907<br>1902 | 4,714<br>3,680      | \$175,642,338<br>85,700,605 | \$125,755,114<br>70,138,147 | \$28,511,550<br>9,910,217 | \$15,348,027<br>4,138,241   | \$6,027,647<br>1,514,000 |
| Total for 10 selected states..... | 1907<br>1902 | 2,205<br>1,911      | 121,418,869<br>59,469,531   | 86,140,793<br>48,490,347    | 19,744,151<br>7,136,945   | 11,717,114<br>2,928,759     | 3,816,811<br>913,490     |
| New York.....                     | 1907<br>1902 | 314<br>256          | 34,859,170<br>16,854,839    | 24,296,438<br>12,920,807    | 5,688,401<br>2,396,046    | 4,082,544<br>1,425,386      | 791,787<br>112,600       |
| Pennsylvania.....                 | 1907<br>1902 | 327<br>279          | 16,015,392<br>9,486,867     | 12,081,602<br>8,321,766     | 2,101,320<br>640,948      | 1,217,875<br>348,702        | 614,592<br>175,451       |
| Illinois.....                     | 1907<br>1902 | 383<br>346          | 15,465,993<br>6,757,015     | 10,278,668<br>5,849,351     | 2,445,280<br>763,764      | 1,842,824<br>79,133         | 899,221<br>64,767        |
| California.....                   | 1907<br>1902 | 129<br>115          | 14,416,529<br>5,066,417     | 8,111,012<br>3,305,318      | 3,826,462<br>1,228,099    | 1,984,554<br>412,673        | 494,501<br>120,827       |
| Massachusetts.....                | 1907<br>1902 | 120<br>114          | 10,749,240<br>6,340,944     | 8,543,327<br>5,263,113      | 1,519,708<br>744,879      | 539,463<br>236,890          | 146,742<br>96,062        |
| Ohio.....                         | 1907<br>1902 | 272<br>233          | 7,643,997<br>4,431,038      | 6,282,861<br>3,873,339      | 1,064,076<br>407,901      | 188,043<br>66,266           | 169,017<br>83,532        |
| Michigan.....                     | 1907<br>1902 | 234<br>201          | 6,072,010<br>2,613,812      | 3,848,797<br>2,285,995      | 873,061<br>173,881        | 1,028,599<br>56,924         | 321,563<br>97,012        |
| New Jersey.....                   | 1907<br>1902 | 64<br>64            | 5,952,378<br>3,421,304      | 5,123,926<br>2,799,961      | 682,028<br>258,055        | 104,791<br>298,583          | 41,633<br>64,705         |
| Missouri.....                     | 1907<br>1902 | 162<br>123          | 5,805,828<br>2,392,149      | 4,116,409<br>1,954,562      | 985,596<br>402,937        | 581,790<br>2,651            | 122,033<br>31,999        |
| Indiana.....                      | 1907<br>1902 | 200<br>180          | 4,438,332<br>2,105,146      | 3,457,753<br>1,916,135      | 568,199<br>120,435        | 196,658<br>1,551            | 215,722<br>67,025        |

The per cent distribution and per cent of increase of the gross income for the 10 selected states is shown in Table 95.

TABLE 95.—Central electric stations—Per cent distribution and per cent of increase for gross income in 10 selected states: 1907 and 1902.

| STATE.                            | PER CENT DISTRIBUTION. |       | Per cent of increase. |
|-----------------------------------|------------------------|-------|-----------------------|
|                                   | 1907                   | 1902  |                       |
| Total for United States.....      | 100.0                  | 100.0 | 104.9                 |
| Total for 10 selected states..... | 69.1                   | 69.4  | 104.2                 |
| New York.....                     | 19.8                   | 19.7  | 106.8                 |
| Pennsylvania.....                 | 9.1                    | 11.1  | 68.8                  |
| Illinois.....                     | 8.8                    | 7.9   | 128.9                 |
| California.....                   | 8.2                    | 5.9   | 184.6                 |
| Massachusetts.....                | 6.1                    | 7.4   | 69.5                  |
| Ohio.....                         | 4.4                    | 5.2   | 72.5                  |
| Michigan.....                     | 3.5                    | 3.0   | 132.3                 |
| New Jersey.....                   | 3.4                    | 4.0   | 74.0                  |
| Missouri.....                     | 3.3                    | 2.8   | 142.7                 |
| Indiana.....                      | 2.5                    | 2.5   | 110.8                 |

Other states not included in Table 94 which report large incomes for 1907 for central electric stations are, Texas, \$3,792,203; Minnesota, \$3,478,009; Washington, \$3,410,542; Colorado, \$3,410,240; Iowa, \$2,479,969; Connecticut, \$2,469,543; Montana, \$2,469,131; and Wisconsin, \$2,278,637. The income reported for the state of Washington is especially noteworthy, being an increase of \$2,626,891, or 335.2 per cent, over 1902. Washington is one of the states which relies largely upon water for primary power, and to the abundance of this economical force for the generation of electricity may be traced its relatively large use in that state.

The income of stations classified according to kind of primary power used and the percentages of increase are shown in Tables 96 and 97.

TABLE 96.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME, BY KIND OF PRIMARY POWER USED: 1907 AND 1902.

|                         | Census.      | Total.                      | Steam exclusively.          | Steam with other minor power. | Water exclusively.        | Water with other minor power. | Water and steam.          | Gas exclusively.       | Stations without primary-power equipment. |
|-------------------------|--------------|-----------------------------|-----------------------------|-------------------------------|---------------------------|-------------------------------|---------------------------|------------------------|-------------------------------------------|
| Number of stations..... | 1907<br>1902 | 4,714<br>3,620              | 3,262<br>2,747              | 93<br>43                      | 474<br>315                | 61<br>20                      | 360<br>275                | 180<br>51              | 284<br>160                                |
| Gross income.....       | 1907<br>1902 | \$175,642,338<br>85,700,606 | \$119,029,194<br>64,730,694 | \$7,967,002<br>3,367,962      | \$11,098,303<br>4,156,506 | \$3,104,158<br>1,059,866      | \$22,700,921<br>9,062,574 | \$1,010,180<br>775,137 | \$10,732,610<br>2,567,867                 |
| Electric service.....   | 1907<br>1902 | 169,614,691<br>84,186,606   | 115,428,251<br>63,795,608   | 7,821,580<br>3,237,584        | 10,454,035<br>4,035,702   | 2,946,122<br>1,034,880        | 21,807,904<br>8,812,006   | 980,910<br>769,900     | 10,475,919<br>2,500,925                   |
| Lighting.....           | 1907<br>1902 | 125,755,114<br>70,138,147   | 92,462,399<br>55,439,357    | 6,582,067<br>2,755,445        | 3,621,562<br>2,165,746    | 1,702,752<br>121,068          | 13,152,818<br>7,004,961   | 884,204<br>706,036     | 7,349,322<br>1,945,544                    |
| Stationary motors.....  | 1907<br>1902 | 28,511,550<br>9,910,217     | 15,934,961<br>6,886,244     | 1,007,776<br>331,031          | 2,986,379<br>986,075      | 918,658<br>80,011             | 5,464,061<br>1,246,918    | 82,221<br>63,741       | 2,117,494<br>316,192                      |
| All other.....          | 1907<br>1902 | 15,348,027<br>4,138,241     | 7,030,901<br>1,470,007      | 231,707<br>151,106            | 3,846,094<br>853,881      | 324,712<br>833,811            | 2,891,025<br>560,127      | 14,485<br>123          | 1,009,103<br>239,184                      |
| All other sources.....  | 1907<br>1902 | 6,027,647<br>1,514,000      | 3,600,943<br>935,066        | 145,452<br>120,378            | 644,268<br>120,803        | 158,086<br>24,986             | 1,193,017<br>240,568      | 29,240<br>5,237        | 256,691<br>66,942                         |

TABLE 97.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT OF INCREASE OF GROSS INCOME, BY KIND OF PRIMARY POWER USED: 1907.

|                         | Total. | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively. | Stations without primary-power equipment. |
|-------------------------|--------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|------------------|-------------------------------------------|
| Number of stations..... | 30.2   | 18.7               | 116.3                         | 50.5               | 205.0                         | 30.9             | 252.9            | 68.0                                      |
| Gross income.....       | 105.9  | 83.9               | 137.3                         | 167.0              | 192.9                         | 150.8            | 30.3             | 318.0                                     |
| Electric service.....   | 101.5  | 80.9               | 141.6                         | 159.0              | 184.7                         | 144.1            | 27.4             | 319.0                                     |
| Lighting.....           | 79.3   | 66.8               | 138.9                         | 67.2               | 1,306.6                       | 87.8             | 25.2             | 277.8                                     |
| Stationary motors.....  | 187.7  | 131.4              | 204.4                         | 202.9              | 1,048.2                       | 338.2            | 29.0             | 598.6                                     |
| All other.....          | 270.9  | 378.3              | 53.3                          | 335.1              | 161.1                         | 416.1            | 11,676.4         | 321.9                                     |
| All other sources.....  | 298.1  | 285.1              | 20.8                          | 433.3              | 532.5                         | 395.9            | 458.3            | 283.5                                     |

1 Decrease.

In another chapter of this report reference is made to the fact that allowance must be made for changes from year to year in the equipment of existing stations in respect to the primary power employed, which would result in the transfer of stations from one class to another without materially adding to the total power equipment. The tables, therefore, should be accepted more as representing the conditions at the two censuses, and as showing the increase in the income reported for the stations using the different kinds of power, rather than as showing the actual growth in the use of any particular kind of primary power.

In 1907 the income for the steam plants, including the stations exclusively equipped with steam power and those which also had other minor power, constituted 72.3 per cent of the total. Even this large proportion does not fully indicate the relative importance of the income resulting from using steam as the primary power, since the stations which were about equally equipped with steam and with water power reported 12.9 per cent of the total gross income, some part of which should rightfully be classed as resulting

from the use of steam. If this amount was divided equally between water and steam, approximately 78.7 per cent of the gross income would be credited as income derived from the use of steam as the primary power, leaving but little more than one-fifth of the income to be divided among the three remaining classes, water-power stations, gas-power stations, and those stations having no primary power. Of these three classes, the stations using water exclusively, or water with other minor power, reported 8.1 per cent of the total income, and if to the income for these stations is added half of the amount reported for stations using both water and steam, the total income derived from the use of water power would represent approximately 14.6 per cent of the total gross income reported. The stations using gas reported but six-tenths of 1 per cent of the total gross income, and those purchasing their power, while showing large and most consistent percentages of increase in each of the several sources of income, reported but 6.1 per cent.

The proportion of income derived from each source is shown for the different classes of stations in Table 98.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 98.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT DISTRIBUTION OF GROSS INCOME FOR EACH KIND OF POWER USED, BY SOURCE OF INCOME: 1907 AND 1902.

|                        | Census.      | Total.         | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively.        | Stations without primary-power equipment. |
|------------------------|--------------|----------------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|-------------------------|-------------------------------------------|
| Gross income.....      | 1907<br>1902 | 100.0<br>100.0 | 100.0<br>100.0     | 100.0<br>100.0                | 100.0<br>100.0     | 100.0<br>100.0                | 100.0<br>100.0   | 100.0<br>100.0          | 100.0<br>100.0                            |
| Electric service.....  | 1907<br>1902 | 96.6<br>98.2   | 97.0<br>98.6       | 98.2<br>96.4                  | 94.2<br>97.1       | 94.9<br>97.6                  | 94.7<br>97.3     | 97.1<br>99.3            | 97.6<br>97.4                              |
| Lighting.....          | 1907<br>1902 | 71.6<br>81.8   | 77.7<br>85.6       | 82.6<br>82.1                  | 32.6<br>52.1       | 54.9<br>11.4                  | 57.9<br>77.4     | 87.5<br>91.1            | 68.5<br>75.8                              |
| Stationary motors..... | 1907<br>1902 | 16.2<br>11.6   | 13.4<br>10.6       | 12.6<br>9.9                   | 26.9<br>23.7       | 29.6<br>7.5                   | 24.1<br>13.8     | 8.1<br>8.2              | 19.7<br>12.3                              |
| All other.....         | 1907<br>1902 | 8.7<br>4.8     | 5.9<br>2.3         | 2.9<br>4.5                    | 34.7<br>21.3       | 10.5<br>78.7                  | 12.7<br>6.2      | 1.4<br>( <sup>1</sup> ) | 9.4<br>9.3                                |
| All other sources..... | 1907<br>1902 | 3.4<br>1.8     | 3.0<br>1.4         | 1.8<br>3.6                    | 5.8<br>2.9         | 5.1<br>2.4                    | 5.3<br>2.7       | 2.9<br>0.7              | 2.4<br>2.6                                |

<sup>1</sup> Less than one-tenth of 1 per cent.

A noteworthy feature of the central-station industry is the relatively small proportion of the total income of the stations using water power which is received from lighting. In 1907 the proportion obtained from this source was smallest (32.6 per cent) for the stations using water power exclusively. On the other hand, the stations using water power show exceptionally large proportions of their income as derived from motor service and from all other electric service. These results are in accordance with the well-known fact that many of the stations equipped with water power sell much of their current to other electric stations or to establishments which use it for motor service, etc. If the proportionate income from lighting reported for 1907 by the three classes using water power is considered separately in relation to the corresponding amounts for 1902, unaccountable differences are found; but when the three classes are considered together the discrepancies disappear. The differences referred to result, no doubt, from minor changes of equipment which transferred stations from

one class to another, but still kept them among those using water power.

The sale of current in bulk has grown to large proportions and constitutes a special branch of the electrical industry. Although a number of stations engaged in it were operated by steam as the primary power, most of the stations that make a specialty of this form of service are hydro-electric plants. In 1907 there were 92 stations, operated either exclusively or primarily by water power, the chief business of which was the sale of current in bulk, this current being transmitted to greater or less distances as necessity demanded. These 92 stations reported a total income of \$13,231,720, of which \$8,783,371, or 66.4 per cent, was from current sold in bulk; \$2,675,852, or 20.2 per cent, from lighting; \$1,221,408, or 9.2 per cent, from all other electric service; and \$551,089, or 4.2 per cent, from sources other than the sale of electricity.

Table 99 shows the income of stations with and those without meters on consumption circuits.

TABLE 99.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME FOR STATIONS WITH AND WITHOUT METERS ON CONSUMPTION CIRCUITS: 1907 AND 1902.

|                         | Census.      | TOTAL.                      |                             |                          | COMMERCIAL.                 |                             |                          | MUNICIPAL.                |                           |                          |
|-------------------------|--------------|-----------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|---------------------------|--------------------------|
|                         |              | Total.                      | With meters.                | Without meters.          | Total.                      | With meters.                | Without meters.          | Total.                    | With meters.              | Without meters.          |
| Number of stations..... | 1907<br>1902 | 4,714<br>3,620              | 4,085<br>2,719              | 629<br>901               | 3,462<br>2,805              | 3,019<br>2,147              | 443<br>658               | 1,252<br>815              | 1,066<br>572              | 186<br>243               |
| Gross income.....       | 1907<br>1902 | \$175,642,338<br>85,700,605 | \$168,590,884<br>79,888,904 | \$7,051,454<br>5,811,701 | \$161,630,339<br>78,735,500 | \$157,341,176<br>75,254,621 | \$4,289,163<br>3,480,879 | \$14,011,999<br>6,965,105 | \$11,249,708<br>4,634,283 | \$2,762,291<br>2,390,822 |
| Electric service.....   | 1907<br>1902 | 169,614,691<br>84,186,605   | 162,702,690<br>78,463,821   | 6,912,001<br>5,722,784   | 156,000,257<br>77,349,749   | 151,818,384<br>73,944,448   | 4,181,873<br>3,405,301   | 13,614,434<br>6,836,856   | 10,884,306<br>4,519,373   | 2,730,128<br>2,317,493   |
| Lighting.....           | 1907<br>1902 | 125,755,114<br>70,138,147   | 121,749,304<br>65,146,516   | 4,005,810<br>4,991,631   | 112,714,851<br>63,389,284   | 111,407,611<br>60,696,174   | 1,307,240<br>2,693,110   | 13,040,263<br>6,748,863   | 10,341,693<br>4,450,342   | 2,698,570<br>2,298,521   |
| Stationary motors.....  | 1907<br>1902 | 28,511,550<br>9,910,217     | 27,896,922<br>9,606,409     | 614,628<br>303,808       | 27,995,177<br>9,839,677     | 27,409,632<br>9,545,887     | 585,545<br>293,790       | 516,373<br>70,540         | 487,290<br>60,522         | 29,083<br>10,018         |
| All other.....          | 1907<br>1902 | 15,348,027<br>4,138,241     | 13,056,464<br>3,710,896     | 2,291,563<br>427,345     | 15,290,229<br>4,120,788     | 13,001,141<br>3,702,387     | 2,289,088<br>418,401     | 57,798<br>17,453          | 55,323<br>8,509           | 2,475<br>8,944           |
| All other sources.....  | 1907<br>1902 | 6,027,647<br>1,514,000      | 5,888,194<br>1,425,083      | 139,453<br>88,917        | 5,630,082<br>1,385,751      | 5,522,792<br>1,310,173      | 107,290<br>75,578        | 397,565<br>128,249        | 365,402<br>114,910        | 32,163<br>13,339         |

The trend of the later methods of electric service is unquestionably in the direction of selling current by meter measurement. The change in this direction, which has been going on for some time, has been accelerated by advances made in the perfection of the meters. It is to the interest of the company furnishing the current to have these machines installed, not only as a matter of self-protection but because every step in the direction of reliability and accuracy is bound to win favor with the consumer.

It should be understood, in connection with Table 99, that although the figures for stations not equipped with meters are complete, as reported, this condition is not in the same degree conclusive for those classed as having meters. The latter class of stations embraces all which reported meters, and included many stations that were not fully equipped in this particular, but sold part of the current at contract or flat rates. The figures, however, demonstrate beyond question the fact that the stations without meters are decreasing in number, notwithstanding the increase in the total number of stations. In 1902, of the total number of stations, 24.9 per cent reported no meters as compared with only 13.3 per cent in 1907. The income for the stations without meters formed 6.8 per cent of the total in 1902 and but 4 per cent in 1907. There was little difference in the relative proportions of the commercial and the municipal stations which had installed meters, but a considerably larger percentage of the income of commercial stations is credited to those having meters than is the case with the municipal stations. The municipal stations have been somewhat slower in the adoption of meters, since many of them, by reason of the fact that the whole or the great bulk of the current produced is used directly by the municipality, do not feel the necessity for such equipment. In the case of the commercial stations the income for stations without meters formed 4.4 per cent of the total for such stations in 1902 and 2.7 per cent in 1907. The corresponding proportions for the municipal stations were 33.5 per cent and 19.7 per cent, respectively.

A comparison of the income of the commercial stations from the several classes of electric service in 1907 and in 1902 shows that the stations without meters reported a decreased proportion of the total in 1907 for all classes of income, except income from all other electric service, for which there was a decided gain. Of the total income from lighting, the proportion for commercial stations without meters decreased from 4.2 per cent to 1.2 per cent, while the percentage of the total income from stationary-motor service reported for this class of stations fell from 3 per cent to

2.1 per cent; in the case of income from all other electric service, however, the percentage increased from 10.2 per cent to 15 per cent. The increase in the income for this latter item is due to the fact that several companies with long-transmission lines, a business largely created since 1902, sold at wholesale large quantities of current at contract rates. In the case of the municipal stations, on the other hand, the part of the total income from all other electric service contributed by stations not equipped with meters shows a falling off from 51.2 per cent in 1902 to 4.3 per cent in 1907.

The income for commercial and for municipal lighting is shown in Table 100.

TABLE 100.—Commercial and municipal central electric stations—Gross income from commercial and public lighting: 1907 and 1902.

|                       | STATIONS.     |               |              |
|-----------------------|---------------|---------------|--------------|
|                       | Total.        | Commercial.   | Municipal.   |
| Lighting, 1907.....   | \$125,755,114 | \$112,714,861 | \$13,040,253 |
| Commercial.....       | 100,337,434   | 92,942,447    | 7,394,987    |
| Public.....           | 25,417,680    | 19,772,404    | 5,645,276    |
| Lighting, 1902.....   | 70,138,147    | 63,389,284    | 6,748,863    |
| Commercial.....       | 50,268,173    | 47,259,711    | 3,108,462    |
| Public.....           | 19,769,974    | 16,129,573    | 3,640,401    |
| Per cent of increase: |               |               |              |
| Total.....            | 79.3          | 77.8          | 83.2         |
| Commercial.....       | 92.2          | 96.7          | 137.9        |
| Public.....           | 28.6          | 16.4          | 55.1         |

By public lighting in this report is meant the lighting of streets, parks, public buildings, and all other public places for the illumination of which the municipality or other governmental division exercising municipal functions is responsible, irrespective of whether such service was rendered by commercial or municipal stations; while commercial lighting embraces all lighting which is furnished to individuals, firms, etc., by either the commercial or the municipal stations.

The income from commercial lighting formed 79.8 per cent of the total income for all kinds of lighting in 1907 and 71.8 per cent in 1902, while the corresponding proportions for public lighting were 20.2 per cent and 28.2 per cent, respectively. Thus the percentage for commercial lighting was larger by 8 per cent in 1907 than in 1902 and the percentage for public lighting correspondingly smaller. Both the actual and the percentage of increase were much greater for commercial than for public lighting. It is apparent from Table 100 that during the period between the two censuses commercial lighting made much more rapid progress than public lighting.

The extent to which the income from lighting is confined to a few states is shown in Table 101.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 101.—CENTRAL ELECTRIC STATIONS—GROSS INCOME FROM COMMERCIAL AND PUBLIC LIGHTING, FOR 15 SELECTED STATES: 1907 AND 1902.

|                                   | TOTAL.        |              | COMMERCIAL LIGHTING. |              | PUBLIC LIGHTING. |              |
|-----------------------------------|---------------|--------------|----------------------|--------------|------------------|--------------|
|                                   | 1907          | 1902         | 1907                 | 1902         | 1907             | 1902         |
| Total for United States.....      | \$125,755,114 | \$70,138,147 | \$100,337,424        | \$50,368,173 | \$25,417,680     | \$19,769,974 |
| Total for 15 selected states..... | 98,183,806    | 55,045,472   | 78,494,819           | 39,173,239   | 19,688,787       | 15,872,233   |
| New York.....                     | 24,296,438    | 12,920,807   | 20,430,168           | 9,359,493    | 3,866,270        | 3,561,314    |
| Pennsylvania.....                 | 12,081,802    | 8,321,766    | 8,790,425            | 5,557,115    | 3,291,177        | 2,784,651    |
| Illinois.....                     | 10,278,668    | 5,849,351    | 8,078,661            | 4,094,781    | 2,300,007        | 1,754,570    |
| Massachusetts.....                | 8,543,327     | 5,263,113    | 6,315,999            | 3,555,731    | 2,227,328        | 1,707,382    |
| California.....                   | 8,111,012     | 3,305,318    | 7,220,210            | 2,737,430    | 890,802          | 567,888      |
| Ohio.....                         | 6,282,861     | 3,873,339    | 4,577,668            | 2,490,635    | 1,705,193        | 1,392,701    |
| New Jersey.....                   | 5,123,926     | 2,799,961    | 3,700,863            | 1,696,783    | 1,423,063        | 1,103,178    |
| Missouri.....                     | 4,116,409     | 1,954,562    | 3,578,819            | 1,610,820    | 537,590          | 343,742      |
| Michigan.....                     | 3,848,797     | 2,285,995    | 2,968,391            | 1,631,983    | 890,406          | 654,012      |
| Indiana.....                      | 3,457,753     | 1,916,135    | 2,572,206            | 1,160,712    | 885,547          | 755,423      |
| Texas.....                        | 3,066,994     | 1,753,681    | 2,745,418            | 1,494,712    | 321,576          | 258,969      |
| Minnesota.....                    | 2,700,959     | 1,615,766    | 2,193,540            | 1,267,424    | 507,419          | 348,342      |
| Colorado.....                     | 2,181,310     | 1,209,760    | 1,921,459            | 964,325      | 259,851          | 225,435      |
| Washington.....                   | 2,078,156     | 586,274      | 1,838,208            | 502,148      | 239,948          | 84,126       |
| Iowa.....                         | 2,015,394     | 1,389,644    | 1,572,784            | 1,039,144    | 442,610          | 350,500      |

The bulk of the income from lighting, 78.1 per cent in 1907 and 78.5 per cent in 1902, was reported by the stations in the 15 states shown in the table. So large a part of the total income is reported by these states that no great difference between the rates of increase for the whole United States and for the 15 states together is to be expected. For the United States the increases were as follows: Total, 79.3 per cent; commercial lighting, 99.2 per cent; public lighting, 28.6 per cent. The corresponding increases for the 15 states were 78.4 per cent, 100.4 per cent, and 24 per cent.

In the report for 1902 a statement was prepared showing the total number of arc and of incandescent lamps, together with the separate income derived from each of the two classes of service, and the average income per lamp based upon these figures. The material for a corresponding statement for 1907 is wanting, on account of the fact that to a great extent the different stations have discontinued keeping accounts giving these data because of the general adoption of the meter system of selling electricity and the fact that it is no longer necessary for the company to know the number of lamps served. Not only is it often impossible to ascertain the separate income for arc and for incandescent lamps, but there is also no way of finding out the extent to which the electric current supplied from the same wire and measured by the same meters has been used for small fan motors and for other miscellaneous purposes. Furthermore, the number of lamps called for in 1907 was the number wired for service on the last day of the year covered by the report, and not, as in 1902, the number in service. In order that some idea may be had of the relative income per lamp at the two censuses, however, a number of reports in which complete answers appear to have been made were selected and tabulated, and the results, together with the figures as published in 1902 for all commercial central

stations in the United States, are presented in the following statement:

*Commercial central electric stations—Average income from lamps as reported in 1902, and as obtained from 110 selected reports in 1907.*

|                              | COMMERCIAL STATIONS.               |                           |
|------------------------------|------------------------------------|---------------------------|
|                              | For 110 selected stations in 1907. | For all stations in 1902. |
| Arc lamps:                   |                                    |                           |
| Commercial lighting—         |                                    |                           |
| Number of lamps.....         | 62,426                             | 168,180                   |
| Income.....                  | \$2,496,837                        | \$8,220,154               |
| Average income per lamp..... | \$40.00                            | \$48.88                   |
| Public lighting—             |                                    |                           |
| Number of lamps.....         | 49,900                             | 166,723                   |
| Income.....                  | \$3,471,622                        | \$13,871,646              |
| Average income per lamp..... | \$69.57                            | \$83.20                   |
| Incandescent lamps:          |                                    |                           |
| Commercial lighting—         |                                    |                           |
| Number of lamps.....         | 8,841,206                          | 16,243,853                |
| Income.....                  | \$17,532,593                       | \$39,039,557              |
| Average income per lamp..... | \$1.98                             | \$2.40                    |
| Public lighting—             |                                    |                           |
| Number of lamps.....         | 112,062                            | 372,740                   |
| Income.....                  | \$426,202                          | \$2,257,927               |
| Average income per lamp..... | \$3.80                             | \$6.06                    |

In selecting the 110 reports used as a basis for an average in 1907, ten reports were taken from each of the following states as fairly representative of the different sections of the United States: California, Illinois, Massachusetts, Missouri, New York, Ohio, Pennsylvania, Tennessee, Texas, Washington, and Wisconsin. Owing to the incomplete character of the data upon which the figures for 1907 are based, they should not be accepted as giving the exact price of lighting, but merely as showing that there is a general and unmistakable tendency toward a lower cost for electric lighting.

Stationary-motor service was second in importance as a source of income, and the states for which in 1907 an income of over \$500,000 was reported are shown in Table 102.



TABLE 102.—Commercial and municipal central electric stations—Gross income from stationary-motor service, for 14 selected states: 1907 and 1902.

|                                   | STATIONARY-MOTOR SERVICE. |             |
|-----------------------------------|---------------------------|-------------|
|                                   | 1907                      | 1902        |
| Total for United States.....      | \$28,511,550              | \$9,910,217 |
| Total for 14 selected states..... | 22,728,096                | 7,771,683   |
| New York.....                     | 5,688,401                 | 2,306,046   |
| California.....                   | 3,526,462                 | 1,228,099   |
| Illinois.....                     | 2,445,280                 | 763,764     |
| Pennsylvania.....                 | 2,101,320                 | 640,948     |
| Massachusetts.....                | 1,519,708                 | 744,879     |
| Ohio.....                         | 1,054,076                 | 407,901     |
| Missouri.....                     | 985,596                   | 402,937     |
| Montana.....                      | 963,669                   | 32,881      |
| Colorado.....                     | 951,536                   | 343,559     |
| Michigan.....                     | 873,081                   | 173,881     |
| New Jersey.....                   | 682,028                   | 258,055     |
| Indiana.....                      | 568,190                   | 120,435     |
| Minnesota.....                    | 536,622                   | 191,432     |
| Washington.....                   | 531,818                   | 66,866      |

Both for 1907 and 1902 the income from stationary-motor service for the 14 states shown in Table 102 was approximately four-fifths of the total for all states and territories, their proportion in 1907 being slightly greater than at the previous census. That New York, the leading state in population and in value of manufactures, with its great water power, should lead also in the income from stationary-motor service is not unexpected, but that California, which at the census of 1900 stood only twenty-first in population and twelfth in value of manufactures, should be easily second in income from this source is surprising, and shows that the use of electric current is more general in that state than elsewhere. It is worthy of mention that notwithstanding the large actual increase in the income from motor service for New York, that state's proportion of the total income for such service fell from 24.2 per cent in 1902 to 20 per cent in 1907; while that for California increased from 12.4 per cent to 13.4 per cent during the same time. The largest proportional increases in the income from motor service are those for Montana, which increased more than twenty-nine fold, and for Washington, which increased nearly eightfold.

Several states not mentioned in Table 102 show large increases in the income from motor service from 1902 to 1907. The figures for these states in the order of their importance are presented in the following tabular statement:

|                     | STATIONARY-MOTOR SERVICE. |           |
|---------------------|---------------------------|-----------|
|                     | 1907                      | 1902      |
| South Carolina..... | \$432,384                 | \$169,353 |
| Connecticut.....    | 407,577                   | 155,732   |
| Texas.....          | 378,897                   | 303,859   |
| Oregon.....         | 375,306                   | 89,942    |
| Maryland.....       | 349,059                   | 91,437    |
| Maine.....          | 284,627                   | 92,032    |
| Iowa.....           | 261,202                   | 78,180    |
| Wisconsin.....      | 253,087                   | 78,992    |
| Kansas.....         | 224,224                   | 48,558    |
| Kentucky.....       | 220,061                   | 92,401    |

There appears to be no satisfactory way of ascertaining the average cost per kilowatt for motor service, since the conditions under which the income was obtained differed widely, not only as to the manner of charges, whether by meter, flat rate, or in bulk, but because of the variations in the length of service, and the certainty that the total kilowatts reported represent a large amount of idle or inactive dynamo capacity, while on the other hand many stations selling a large part of the electrical energy in bulk were unable to report the kilowatt capacity of the stationary motors used by the customers to whom the current was delivered. The capacity of the stationary motors both in 1907 and 1902 was reported in units of horsepower which, by being reduced to kilowatts, shows a total of 1,230,173 in 1907, and 326,752 in 1902. Using the figures as reported with their known failure to represent accurate totals, but assuming, for purposes of comparison, that the element of error was about equal at the two censuses, the average income per kilowatt capacity of stationary motors was less in 1907 than in 1902, the actual figures being \$23.18 per kilowatt and \$30.33 per kilowatt for the two censuses, respectively.

Next in order of importance to income from lighting and from stationary-motor service was the income from the sale of current to electric railways and to other electric companies. In Table 103 the income from all other electric service is classified into that from current sold to electric railways, that from current sold to other electric companies, and that from current sold for miscellaneous purposes, such as charging automobiles, operating fans, electric heating, cooking, welding, etc.

TABLE 103.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME FROM "ALL OTHER ELECTRIC SERVICE:" 1907 AND 1902.

| SOURCE OF INCOME.                             | TOTAL.       |             |                       | COMMERCIAL.  |             |                       | MUNICIPAL. |          |                       |
|-----------------------------------------------|--------------|-------------|-----------------------|--------------|-------------|-----------------------|------------|----------|-----------------------|
|                                               | 1907         | 1902        | Per cent of Increase. | 1907         | 1902        | Per cent of Increase. | 1907       | 1902     | Per cent of Increase. |
| Total.....                                    | \$15,348,027 | \$4,138,241 | 270.9                 | \$15,290,229 | \$4,120,788 | 271.1                 | \$57,798   | \$17,455 | 231.2                 |
| Current sold to electric railways.....        | 7,841,497    | 2,304,515   | 240.3                 | 7,829,275    | 2,301,343   | 240.2                 | 12,222     | 3,172    | 285.3                 |
| Current sold to other electric companies..... | 5,519,746    | 1,727,112   | 219.6                 | 5,513,302    | 1,723,427   | 219.9                 | 6,444      | 3,685    | 74.9                  |
| Miscellaneous electric service.....           | 1,986,784    | 106,614     | 1,733.5               | 1,947,652    | 96,018      | 1,928.4               | 39,132     | 10,596   | 269.3                 |

In 1907, of the total income from "All other electric service," 87.1 per cent was from current sold to electric-railway companies and to other electric companies as compared with 97.4 per cent in 1902. It appears, therefore, that notwithstanding the increase of 231.4 per cent in the total for such sales, the gain was proportionately less than that for the current sold for miscellaneous purposes. The income from this latter source increased from \$106,614 in 1902 to \$1,986,784 in 1907, or more than eighteenfold. More than two-thirds of this miscellaneous income was reported by stations in the state of New York, and most of it represented current sold for manufacturing purposes, much of which was sold to manufacturers using the electrolytic process. The continued cheapening of electric power and its growing popularity resulting from the

wide range of uses to which it may be put, the ease with which it is made available, its cleanliness and convenience, and the quickness with which it may be applied or discontinued, together with its constantly increasing uses, indicate that the next census will show a greatly increased use of electrical energy for miscellaneous purposes.

Both in 1907 and in 1902 the proportion\* of the earnings from "All other electric service" derived from current sold to electric railways exceeded that from current sold to other electric companies.

The income from current sold to electric railways and to other electric companies is shown in Table 104 for the 12 states, each of which reported an income of more than \$100,000 for the former character of service in 1907.

TABLE 104.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—GROSS INCOME FROM CURRENT SOLD TO ELECTRIC RAILWAYS AND TO OTHER ELECTRIC COMPANIES, FOR 12 SELECTED STATES: 1907 AND 1902.

|                                   | TOTAL.       |             | INCOME FROM CURRENT SOLD TO ELECTRIC RAILWAYS. |             | INCOME FROM CURRENT SOLD TO OTHER ELECTRIC COMPANIES. |             |
|-----------------------------------|--------------|-------------|------------------------------------------------|-------------|-------------------------------------------------------|-------------|
|                                   | 1907         | 1902        | 1907                                           | 1902        | 1907                                                  | 1902        |
| Total for United States.....      | \$13,361,243 | \$4,031,627 | \$7,841,497                                    | \$2,304,515 | \$5,519,746                                           | \$1,727,112 |
| Total for 12 selected states..... | 11,109,212   | 2,873,422   | 6,943,834                                      | 1,549,079   | 4,165,378                                             | 1,324,343   |
| New York.....                     | 2,748,057    | 1,356,819   | 1,168,700                                      | 389,829     | 1,579,357                                             | 966,990     |
| California.....                   | 1,946,894    | 430,602     | 1,396,735                                      | 183,986     | 550,159                                               | 246,616     |
| Illinois.....                     | 1,752,933    | 78,513      | 1,604,328                                      | 64,360      | 148,605                                               | 14,153      |
| Pennsylvania.....                 | 1,174,879    | 370,299     | 901,564                                        | 324,749     | 273,315                                               | 45,550      |
| Michigan.....                     | 958,753      | 63,661      | 277,115                                        | 55,830      | 681,638                                               | 7,831       |
| Washington.....                   | 607,980      | 99,600      | 143,183                                        | 86,588      | 464,797                                               | 13,012      |
| Missouri.....                     | 573,478      | 2,651       | 477,784                                        | 2,651       | 95,694                                                | .....       |
| Massachusetts.....                | 532,692      | 237,817     | 288,638                                        | 226,547     | 244,054                                               | 11,270      |
| New Hampshire.....                | 290,971      | 75,684      | 217,361                                        | 71,586      | 73,610                                                | 4,098       |
| Texas.....                        | 187,276      | 106,043     | 187,276                                        | 91,220      | .....                                                 | 14,823      |
| Oregon.....                       | 179,518      | 51,000      | 167,072                                        | 51,000      | 12,446                                                | .....       |
| Indiana.....                      | 155,781      | 733         | 114,078                                        | 733         | 41,703                                                | .....       |

Of the total income for the two classes of service, 83.1 per cent in 1907 and 71.3 per cent in 1902 was contributed by the 12 states for which figures are shown in the table. In both years the income from current sold to electric railways exceeded that from current sold to other electric companies both for the United States and for the 12 states together. The 12 states increased their proportion of the total income from current sold to electric railways from 67.2 per cent in 1902 to 88.6 per cent in 1907; but the proportion of the total income from current sold to other electric companies reported by them declined from 76.7 per cent to 75.5 per cent. Several of the states—the most notable of which are Illinois, California, New York, Missouri, and Indiana—show remarkable gains in the income from current sold to electric railways, while Michigan and Washington show remarkable increases in the income from current sold to other electric companies.

Through the selection of states with reference to the income from the sale of current to electric railways, several were omitted which in 1907 reported an income

of more than \$100,000 from current sold to other electric companies, as follows: Georgia, \$204,654; Utah, \$203,587; Montana, \$188,529; Colorado, \$154,412; and Connecticut, \$122,973.

An analysis of the income from miscellaneous service is given in Table 105.

TABLE 105.—Commercial and municipal central electric stations—Income from electric service other than that for lighting, motor service, and current sold to railways and to other electric companies: 1907.

| KIND OF SERVICE.                              | Total.      | Commer-<br>cial. | Municipal. |
|-----------------------------------------------|-------------|------------------|------------|
| Total.....                                    | \$1,986,784 | \$1,947,652      | \$39,132   |
| Electric heating, cooking, welding, etc.....  | 271,591     | 265,241          | 6,350      |
| Charging automobiles.....                     | 154,747     | 153,450          | 1,298      |
| Running fans.....                             | 197,736     | 172,746          | 24,990     |
| Heating irons.....                            | 17,636      | 14,451           | 3,185      |
| Furnishing current for moving-picture shows.. | 2,195       | 1,529            | 666        |
| Charging batteries, motor boats, etc.....     | 696         | 696              | .....      |
| Furnishing current for signs.....             | 10,121      | 10,121           | .....      |
| Not specified.....                            | 231,858     | 230,010          | 1,848      |
| Other miscellaneous <sup>1</sup> .....        | 1,100,204   | 1,099,399        | 805        |

<sup>1</sup> A very small part of this amount was for current used to operate motors, but the income was mostly derived from current sold to electrolytic, electrochemical, or electrothermal plants for the production of aluminum, carborundum, carbide of calcium, caustic soda, etc.

The income from electric heating, cooking, welding, etc., and the income from charging automobiles were the only items in Table 105 which were specifically asked for in the schedule, and the remaining items represent a tabulation of amounts reported by companies which in answering the inquiry in reference to income from all other electric service specified the exact nature of the service. It is not believed that any of these items fully represents the actual earnings from the specific service. The introduction of the meter system of measuring the current used has, as before stated, tended to render it impracticable to distinguish between the use of current for lighting and for various other purposes in cases where the service is from the same wire and the total amount of electrical energy is recorded by the same meter.

## EXPENSES.

The items of expense, the statistics for which are shown in the following tables, include salaries and wages of employees; supplies and materials used in connection with the operation of the plants; the cost

of such supplies and materials as were sold and the proceeds reported under income; the cost of fuel; the amount expended for the purchase of power; and other miscellaneous expenses, which include such items as taxes, ordinary repairs to buildings and machinery, rent of stations, line-wire supports, insurance, injuries and damages, advertising, legal expenses, interest, and in fact all other expenses not elsewhere reported. It does not, however, include interest on bonds, as did the report for 1902.

The items of expense for the commercial and municipal stations are shown in Table 106.

The proportions of the total expenses reported by the two classes of stations show but little variation at the two censuses. In 1907 the commercial stations reported 91.4 per cent of the total, a decrease of one-tenth of 1 per cent from the corresponding proportion for 1902, while the municipal stations reported 8.6 per cent of the total. The percentages of increase were greater for the latter class of stations, except for power purchased and for rent and other miscellaneous expenses.

TABLE 106.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—EXPENSES: 1907 AND 1902.

|                                     | Census.      | Total.                      | Commercial.                | Municipal.               | PER CENT OF TOTAL. |              | PER CENT OF INCREASE. |             |            |
|-------------------------------------|--------------|-----------------------------|----------------------------|--------------------------|--------------------|--------------|-----------------------|-------------|------------|
|                                     |              |                             |                            |                          | Commercial.        | Municipal.   | Total.                | Commercial. | Municipal. |
| Number of stations.....             | 1907<br>1902 | 4,714<br>3,620              | 3,462<br>2,806             | 1,252<br>815             | 73.4<br>77.5       | 26.6<br>22.5 | 30.2                  | 23.4        | 53.6       |
| Total expenses.....                 | 1907<br>1902 | \$106,205,149<br>55,457,830 | \$97,037,961<br>50,716,648 | \$9,167,188<br>4,741,182 | 91.4<br>91.5       | 8.6<br>8.5   | 91.5                  | 91.3        | 93.4       |
| Salaries and wages.....             | 1907<br>1902 | 35,420,324<br>20,646,692    | 31,935,309<br>18,766,970   | 3,485,015<br>1,879,722   | 90.2<br>90.9       | 9.8<br>9.1   | 71.6                  | 70.2        | 85.4       |
| Cost of supplies and materials..... | 1907<br>1902 | 14,326,351<br>9,149,664     | 12,969,731<br>8,296,763    | 1,356,620<br>852,901     | 90.5<br>90.7       | 9.5<br>9.3   | 56.6                  | 56.3        | 59.1       |
| Cost of fuel.....                   | 1907<br>1902 | 23,057,745<br>11,635,509    | 19,824,962<br>10,189,685   | 3,232,783<br>1,445,824   | 86.0<br>87.6       | 14.0<br>12.4 | 96.2                  | 94.6        | 123.6      |
| Power purchased.....                | 1907<br>1902 | 7,074,472<br>2,130,759      | 6,696,188<br>2,007,193     | 378,284<br>123,566       | 94.7<br>94.2       | 5.3<br>5.8   | 232.0                 | 233.6       | 206.1      |
| Miscellaneous expenses.....         | 1907<br>1902 | 26,326,257<br>11,895,206    | 25,611,771<br>11,456,037   | 714,486<br>439,169       | 97.3<br>96.3       | 2.7<br>3.7   | 121.3                 | 123.6       | 62.7       |

The proportion that each item of expense bears to the total is shown in Table 107.

TABLE 107.—Commercial and municipal central electric stations—Per cent that each item of expense is of total: 1907 and 1902.

|                                  | TOTAL. |       | COMMERCIAL. |       | MUNICIPAL. |       |
|----------------------------------|--------|-------|-------------|-------|------------|-------|
|                                  | 1907   | 1902  | 1907        | 1902  | 1907       | 1902  |
| Total expenses.....              | 100.0  | 100.0 | 100.0       | 100.0 | 100.0      | 100.0 |
| Salaries and wages.....          | 33.4   | 37.2  | 32.9        | 37.0  | 38.0       | 39.6  |
| Cost of supplies and materials.. | 13.5   | 16.5  | 13.4        | 16.4  | 14.8       | 18.0  |
| Cost of fuel.....                | 21.7   | 21.0  | 20.4        | 20.1  | 35.3       | 30.5  |
| Power purchased.....             | 6.7    | 3.8   | 6.9         | 4.0   | 4.1        | 2.6   |
| Miscellaneous expenses.....      | 24.8   | 21.4  | 26.4        | 22.6  | 7.8        | 9.3   |

Table 107 shows that salaries and wages formed the largest proportion of the total expenses, being upward of one-third of the total at both censuses. Miscella-

neous expenses, including rents, taxes, insurance, etc., was second in importance, forming nearly one-fourth of the total expenses in 1907 and more than one-fifth in 1902. The cost of fuel was of nearly equal importance with the last-mentioned item, and represented nearly the same proportion of the total at each of the two censuses. The cost of supplies and materials includes the amount expended during the year for such articles as meters, motors, transformers, lamps and fittings, poles or other supports, and wire and cable, etc., which were used in connection with the operation of the station or for ordinary repairs and replacements. It does not, however, include the cost of such of these articles as were used for new construction or for extension or additions to the plant or equipment. It also includes the cost of such of these articles as were sold, and the proceeds reported by the

company as an income, rent of water privileges for water wheels or turbines, and freight on material which was not included in the cost. The cost of power purchased was the least important class of expense, representing only 6.7 per cent of the total in 1907, but

shows the largest proportionate increase of any of the items contained in the table.

The distribution of expenses between the purely electric and the composite stations is shown in Table 108.

TABLE 108.—PURELY ELECTRIC AND COMPOSITE CENTRAL ELECTRIC STATIONS—EXPENSES: 1907 AND 1902.

|                                     | Census.      | Total.                      | Purely electric.           | Composite.                 | PER CENT OF TOTAL. |              | PER CENT OF INCREASE. |                  |            |
|-------------------------------------|--------------|-----------------------------|----------------------------|----------------------------|--------------------|--------------|-----------------------|------------------|------------|
|                                     |              |                             |                            |                            | Purely electric.   | Composite.   | Total.                | Purely electric. | Composite. |
| Number of stations.....             | 1907<br>1902 | 4,714<br>3,620              | 2,648<br>2,139             | 2,066<br>1,481             | 56.2<br>59.1       | 43.8<br>40.9 | 30.2                  | 23.8             | 39.5       |
| Total expenses.....                 | 1907<br>1902 | \$108,205,149<br>55,457,830 | \$63,490,175<br>37,272,578 | \$42,714,974<br>18,185,252 | 58.8<br>67.2       | 40.2<br>32.8 | 91.5                  | 70.3             | 134.9      |
| Salaries and wages.....             | 1907<br>1902 | 35,420,324<br>20,646,082    | 20,914,204<br>13,891,426   | 14,506,120<br>6,755,266    | 59.0<br>67.3       | 41.0<br>32.7 | 71.6                  | 50.6             | 114.7      |
| Cost of supplies and materials..... | 1907<br>1902 | 14,326,351<br>9,149,664     | 8,290,513<br>6,090,750     | 6,035,838<br>3,068,914     | 57.9<br>66.6       | 42.1<br>33.4 | 56.6                  | 36.1             | 97.3       |
| Cost of fuel.....                   | 1907<br>1902 | 23,057,745<br>11,635,509    | 12,476,568<br>7,433,874    | 10,581,177<br>4,201,635    | 54.1<br>63.9       | 45.9<br>36.1 | 98.2                  | 67.8             | 151.8      |
| Power purchased.....                | 1907<br>1902 | 7,074,472<br>2,130,759      | 4,959,519<br>1,521,654     | 2,114,953<br>609,105       | 70.1<br>71.4       | 29.9<br>28.6 | 232.0                 | 225.9            | 247.2      |
| Miscellaneous expenses.....         | 1907<br>1902 | 26,326,257<br>11,895,206    | 16,849,371<br>8,334,874    | 9,478,886<br>3,560,332     | 64.0<br>70.1       | 36.0<br>29.9 | 121.3                 | 102.1            | 166.2      |

All the items of expense showed larger percentages of increase for the composite stations than for the purely electric stations, a condition similar to that which was shown in Table 85 for income. The proportion that the composite stations form of the total number was greater in 1907 than in 1902, but the proportion of the total expenses that was reported by this class showed a still larger increase. It is noteworthy that the composite stations show their smallest proportion of the total of the various items for power purchased. This is natural, as many of them owe their existence to the fact that there is a surplus of primary power from some other industry which is harnessed to a dynamo for the generation of electrical energy. For each item of expense the proportion chargeable to the purely electric stations was less in 1907 than in 1902.

The proportion that each item of expense is of the total for the purely electric and the composite central electric stations is shown in Table 109.

TABLE 109.—Purely electric and composite central electric stations—Per cent that each item of expense is of total: 1907 and 1902.

|                                  | TOTAL. |       | PURELY ELECTRIC. |       | COMPOSITE. |       |
|----------------------------------|--------|-------|------------------|-------|------------|-------|
|                                  | 1907   | 1902  | 1907             | 1902  | 1907       | 1902  |
| Total expenses.....              | 100.0  | 100.0 | 100.0            | 100.0 | 100.0      | 100.0 |
| Salaries and wages.....          | 33.4   | 37.2  | 32.9             | 37.3  | 34.0       | 37.1  |
| Cost of supplies and materials.. | 13.5   | 16.5  | 13.1             | 16.3  | 14.1       | 16.8  |
| Cost of fuel.....                | 21.7   | 21.0  | 19.7             | 19.9  | 24.8       | 23.1  |
| Power purchased.....             | 6.7    | 3.8   | 7.8              | 4.1   | 5.0        | 3.3   |
| Miscellaneous expenses.....      | 24.8   | 21.4  | 26.5             | 22.4  | 22.2       | 19.6  |

The proportion of the total expenses represented by salaries and wages, which formed about one-third of the total expenses for both the purely electric and the composite stations, and by the cost of supplies and

materials, which formed rather more than one-eighth for each class, shows a decrease in 1907 as compared with 1902. The proportionate cost of fuel remained nearly constant for both classes of stations. For each of the two classes of stations miscellaneous expenses formed a greater proportion of the total expenses in 1907 than in 1902, the gain being the larger for the purely electric stations, for which it formed more than one-fourth of the total expenses in 1907. This latter class of stations also reported much the greater increase in the proportion represented by the cost of power purchased, which nearly doubled between 1902 and 1907.

The expenses of stations, classified according to the kind of primary power used and the percentages of increase, are shown in Tables 110 and 111.

Although the expenses of the stations operated by steam power exclusively show an increase of 74.6 per cent, the percentage of the total expenses reported for this class of stations shows a decrease of 6.8 in 1907 as compared with 1902. Only one other class of stations, those using gas exclusively, showed a diminution in its percentage of the total expenses at the later census as compared with the earlier. Although the expenses for this latter class of stations show an increase of 61.7 per cent, this was the smallest increase shown for any of the seven classes for which figures are given in Table 110. Each of the remaining classes of stations increased its proportion of the total expenses in 1907, and the stations using water with other minor power and the stations not equipped with primary power more than doubled their proportions. Of the total increase in the cost of power purchased, 56.9 per cent was contributed by the stations without primary power, which reported 53.2 per cent of the total cost of power in 1907 as compared with 44.5 per cent in 1902.

# INCOME AND EXPENSES.

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**TABLE 110.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—EXPENSES, BY KIND OF PRIMARY POWER USED: 1907 AND 1902.**

|                                     | Census.      | Total.                      | Steam exclusively.         | Steam with other minor power. | Water exclusively.       | Water with other minor power. | Water and steam.          | Gas exclusively.     | Stations without primary-power equipment. |
|-------------------------------------|--------------|-----------------------------|----------------------------|-------------------------------|--------------------------|-------------------------------|---------------------------|----------------------|-------------------------------------------|
| Number of stations.....             | 1907<br>1902 | 4,714<br>3,620              | 3,262<br>2,747             | 93<br>43                      | 474<br>315               | 61<br>20                      | 360<br>275                | 180<br>51            | 284<br>169                                |
| Total expenses.....                 | 1907<br>1902 | \$106,205,149<br>55,457,830 | \$74,178,650<br>42,492,368 | \$5,147,919<br>2,228,828      | \$4,972,066<br>2,448,675 | \$1,536,930<br>342,327        | \$12,234,923<br>5,675,249 | \$710,849<br>439,650 | \$7,423,812<br>1,830,733                  |
| Salaries and wages.....             | 1907<br>1902 | 35,420,324<br>20,646,692    | 24,120,179<br>15,462,511   | 1,807,087<br>798,666          | 2,173,107<br>1,193,781   | 622,989<br>196,698            | 4,630,594<br>2,399,751    | 298,838<br>166,379   | 1,767,510<br>428,906                      |
| Cost of supplies and materials..... | 1907<br>1902 | 14,326,351<br>9,149,664     | 9,594,330<br>7,360,161     | 817,898<br>368,857            | 801,852<br>303,496       | 175,232<br>20,295             | 2,229,294<br>887,737      | 94,275<br>55,845     | 613,470<br>153,273                        |
| Cost of fuel.....                   | 1907<br>1902 | 23,057,745<br>11,635,509    | 19,480,534<br>10,126,800   | 1,377,563<br>596,019          | 26,844<br>5,511          | 184,569<br>7,602              | 1,716,574<br>832,601      | 192,835<br>60,620    | 78,826<br>6,456                           |
| Power purchased.....                | 1907<br>1902 | 7,074,472<br>2,130,759      | 2,599,803<br>532,759       | 160,646<br>64,143             | 108,823<br>284,298       | 10,703<br>720                 | 433,535<br>193,623        | 7,597<br>107,132     | 3,763,365<br>948,184                      |
| Miscellaneous expenses.....         | 1907<br>1902 | 26,326,257<br>11,895,206    | 18,393,804<br>9,010,137    | 984,725<br>401,143            | 1,861,440<br>661,589     | 543,437<br>117,012            | 3,224,926<br>1,361,637    | 117,284<br>49,774    | 1,200,641<br>293,914                      |

**TABLE 111.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT INCREASE OF EXPENSES, BY KIND OF PRIMARY POWER USED: 1907.**

|                                     | Total. | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively. | Stations without primary-power equipment. |
|-------------------------------------|--------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|------------------|-------------------------------------------|
| Number of stations.....             | 30.2   | 18.7               | 116.3                         | 50.5               | 205.0                         | 30.9             | 252.9            | 68.0                                      |
| Total expenses.....                 | 91.5   | 74.6               | 131.0                         | 103.1              | 349.0                         | 115.6            | 61.7             | 305.5                                     |
| Salaries and wages.....             | 71.6   | 56.0               | 126.3                         | 82.0               | 216.7                         | 93.0             | 79.6             | 312.0                                     |
| Cost of supplies and materials..... | 56.6   | 30.4               | 121.7                         | 164.2              | 763.4                         | 151.1            | 68.8             | 312.1                                     |
| Cost of fuel.....                   | 98.2   | 92.4               | 131.1                         | 387.1              | 2,327.9                       | 106.2            | 218.6            | 1,121.0                                   |
| Power purchased.....                | 232.0  | 386.1              | 150.4                         | 161.7              | 1,386.5                       | 124.0            | 192.9            | 296.9                                     |
| Miscellaneous expenses.....         | 121.3  | 104.1              | 145.5                         | 181.4              | 364.4                         | 136.8            | 135.6            | 308.5                                     |

<sup>1</sup> Decrease.

For the separate items of expense the percentages of gains or losses vary so surprisingly that they can only be accounted for by a transfer of stations from one group to another by reason of changes in or addition to their primary power. There is no doubt that many changes of this character have taken place since 1902, as a result of which stations reported in one class at that census are shown in another class in 1907; and the

totals, therefore, in Table 110, although showing existing conditions at each census, may not correctly portray the increase in the sense in which this term is generally applied.

The percentages which the several items of expense form of the total for each class of stations are shown in Table 112.

**TABLE 112.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PER CENT DISTRIBUTION OF TOTAL EXPENSES FOR EACH KIND OF POWER USED, BY ITEMS OF EXPENSE: 1907 AND 1902.**

|                                     | Census.      | Total.         | Steam exclusively. | Steam with other minor power. | Water exclusively. | Water with other minor power. | Water and steam. | Gas exclusively. | Stations without primary-power equipment. |
|-------------------------------------|--------------|----------------|--------------------|-------------------------------|--------------------|-------------------------------|------------------|------------------|-------------------------------------------|
| Total expenses.....                 | 1907<br>1902 | 100.0<br>100.0 | 100.0<br>100.0     | 100.0<br>100.0                | 100.0<br>100.0     | 100.0<br>100.0                | 100.0<br>100.0   | 100.0<br>100.0   | 100.0<br>100.0                            |
| Salaries and wages.....             | 1907<br>1902 | 33.4<br>37.2   | 32.5<br>36.4       | 35.1<br>35.8                  | 43.7<br>48.8       | 40.5<br>57.5                  | 37.8<br>42.3     | 42.0<br>37.8     | 23.8<br>23.4                              |
| Cost of supplies and materials..... | 1907<br>1902 | 13.5<br>16.5   | 12.9<br>17.3       | 15.9<br>16.5                  | 16.1<br>12.4       | 11.4<br>5.9                   | 18.2<br>15.6     | 13.3<br>12.7     | 8.3<br>8.4                                |
| Cost of fuel.....                   | 1907<br>1902 | 21.7<br>21.0   | 26.3<br>23.8       | 26.8<br>26.7                  | 0.5<br>0.2         | 12.0<br>2.2                   | 14.0<br>14.7     | 27.1<br>13.8     | 1.1<br>0.4                                |
| Power purchased.....                | 1907<br>1902 | 6.7<br>3.8     | 3.5<br>1.3         | 3.1<br>2.9                    | 2.2<br>11.6        | 0.7<br>0.2                    | 3.5<br>3.4       | 1.1<br>24.4      | 50.7<br>51.8                              |
| Miscellaneous expenses.....         | 1907<br>1902 | 24.8<br>21.4   | 24.8<br>21.2       | 19.1<br>18.0                  | 37.4<br>27.0       | 35.4<br>34.2                  | 26.4<br>24.0     | 16.5<br>11.3     | 16.2<br>16.1                              |

Salaries and wages forms the largest item of expense for each class of stations equipped with primary power. That the stations having steam as the exclusive primary power showed the smallest proportionate expense for salaries and wages, is due in a measure to the fact that the cost of fuel forms a large item of expense for these stations, in addition to which this class includes a large proportion of the municipal stations for which the expense for salaries and wages is small. The percentage represented by cost of supplies and materials is reasonably uniform for the classes having primary power. Naturally, the stations having steam power show the largest proportionate cost of fuel. That the stations using water power exclusively and those classed as without primary power report fuel, may be explained by the fact that a number of stations which had been operated by steam in the early part of the year had removed their steam equipment and were operated by water power or wholly discontinued the use of primary power at the close of the year, the date for which the stations are classified as to kind of power and in other respects. The per cent distribution of expenses for the stations without primary power is scarcely comparable with those for the other classes of stations. About half the cost of operation of these stations lay in power purchased.

*Salaries and wages.*—The employees whose remuneration figures in the expense tables of this report include all those engaged in operating the plant and keeping the equipment in proper condition. The number and the salaries and wages of employees engaged exclusively upon new work or additions and extensions

are not included, since this expense is reported as part of the cost of construction during the year. If, however, any of the regular employees of the station who are ordinarily engaged in the operation of the plant were engaged a part of the time on new construction or additions, the amount paid such employees was included under "Salaries and wages." If rent, board, or other allowance was furnished as part compensation it was included in the total for salaries and wages. In the case of composite stations it frequently happens that such employees as general managers, clerks, engineers, and firemen work indiscriminately for the electric station and for the gas works or waterworks, etc., and in these instances an estimate was made of the proportion of salaries and wages chargeable to the electric service. No attempt has been made in this report to show the average wages of employees. One of the reasons for this is that a number of stations were in operation only a part of the year; and since these stations would show the full normal number of employees but wages for only that part of the year for which they were employed, the average wage as determined by dividing the total wages paid during the year by the average number of employees would produce results considerably less than the facts would warrant. The figures given for the average number of wage-earners represented approximately the number necessary to conduct the plant under normal conditions, or the average calculated from the weekly pay rolls of the company.

Detailed statistics of salaries and wages are presented in Table 113.

TABLE 113.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—EMPLOYEES, SALARIES, AND WAGES: 1907 AND 1902.

|                                               | TOTAL.       |              | COMMERCIAL.  |              | MUNICIPAL.  |             | PER CENT OF INCREASE. |                  |                 | PER CENT OF TOTAL. |       |            |      |
|-----------------------------------------------|--------------|--------------|--------------|--------------|-------------|-------------|-----------------------|------------------|-----------------|--------------------|-------|------------|------|
|                                               | 1907         | 1902         | 1907         | 1902         | 1907        | 1902        | Total.                | Com-<br>mercial. | Munici-<br>pal. | Commercial.        |       | Municipal. |      |
|                                               |              |              |              |              |             |             |                       |                  |                 | 1907               | 1902  | 1907       | 1902 |
| <b>Total:</b>                                 |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Number.....                                   | 47,632       | 30,326       | 42,066       | 26,909       | 5,566       | 3,417       | 57.1                  | 56.3             | 62.9            | 88.3               | 88.7  | 11.7       | 11.3 |
| Salaries and wages.....                       | \$35,420,324 | \$20,646,692 | \$31,935,309 | \$18,766,970 | \$3,485,015 | \$1,879,722 | 71.6                  | 70.2             | 85.4            | 90.2               | 90.9  | 9.8        | 9.1  |
| <b>Salaries employees:</b>                    |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| General officers of corpora-<br>tions—        |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Number.....                                   | 1,761        | 1,416        | 1,761        | 1,416        |             |             | 24.4                  | 24.4             |                 | 100.0              | 100.0 |            |      |
| Salaries.....                                 | \$2,202,028  | \$1,465,471  | \$2,202,028  | \$1,465,471  |             |             | 50.3                  | 50.3             |                 | 100.0              | 100.0 |            |      |
| General managers, superin-<br>tendents, etc.— |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Number.....                                   | 4,357        | 2,564        | 3,268        | 1,875        | 1,089       | 689         | 69.9                  | 74.3             | 58.1            | 75.0               | 73.1  | 25.0       | 26.9 |
| Salaries.....                                 | \$5,058,236  | \$2,481,278  | \$4,243,307  | \$2,088,298  | \$814,929   | \$392,980   | 103.9                 | 103.2            | 107.4           | 83.9               | 84.2  | 16.1       | 15.8 |
| Clerks and bookkeepers—                       |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Number.....                                   | 6,872        | 3,016        | 6,346        | 2,755        | 526         | 261         | 127.9                 | 130.3            | 101.5           | 92.2               | 91.3  | 7.7        | 8.7  |
| Salaries.....                                 | \$4,473,523  | \$1,716,831  | \$4,293,620  | \$1,652,430  | \$179,903   | \$64,401    | 160.6                 | 159.8            | 179.3           | 96.0               | 96.2  | 4.0        | 3.8  |
| <b>Wage-earners:</b>                          |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Foremen—                                      |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Average number.....                           | 1,434        | 1,000        | 1,344        | 943          | 90          | 57          | 43.4                  | 42.5             | 57.9            | 93.7               | 94.3  | 6.3        | 5.7  |
| Wages.....                                    | \$1,527,494  | \$953,738    | \$1,446,048  | \$910,972    | \$81,446    | \$42,766    | 60.2                  | 58.7             | 90.4            | 94.7               | 95.5  | 5.3        | 4.5  |
| Inspectors—                                   |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Average number.....                           | 894          | 571          | 860          | 546          | 34          | 25          | 56.6                  | 57.5             | 36.0            | 96.2               | 95.6  | 3.8        | 4.4  |
| Wages.....                                    | \$697,097    | \$415,904    | \$668,465    | \$397,983    | \$28,632    | \$17,921    | 67.6                  | 68.0             | 59.8            | 95.9               | 95.7  | 4.1        | 4.3  |
| Engineers—                                    |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Average number.....                           | 5,857        | 4,587        | 4,446        | 3,743        | 1,411       | 844         | 27.7                  | 18.8             | 67.2            | 75.9               | 81.6  | 24.1       | 18.4 |
| Wages.....                                    | \$4,453,378  | \$3,259,870  | \$3,484,231  | \$2,721,127  | \$969,147   | \$538,743   | 36.6                  | 28.0             | 79.9            | 78.2               | 83.5  | 21.8       | 16.5 |
| <b>All other—</b>                             |              |              |              |              |             |             |                       |                  |                 |                    |       |            |      |
| Average number.....                           | 26,457       | 17,172       | 24,041       | 15,631       | 2,416       | 1,541       | 54.1                  | 53.8             | 56.8            | 90.9               | 91.0  | 9.1        | 9.0  |
| Wages.....                                    | \$17,008,568 | \$10,353,600 | \$15,597,610 | \$9,530,689  | \$1,410,958 | \$822,911   | 64.3                  | 63.7             | 71.5            | 91.7               | 92.1  | 8.3        | 7.9  |

Table 113 shows that of the total number of employees of electric light and power stations in 1907, the municipal stations employed 11.7 per cent. For the same year the proportion of the gross income reported by this class of stations, as given in Table 83, was 8 per cent. Thus the number of employees of the municipal stations is greater in proportion to their income than in the case of the commercial stations. This does not hold for all classes of employees, but is conspicuously true for general managers, superintendents, etc., among the salaried employees, and for the engineers among the wage-earners. The large number of the latter class is probably due to the fact that in the small stations which so largely predominate in the municipal stations the same employee often performs a number of different kinds of work, and the man, among his other duties, might have operated the engine, and hence would be reported as an engineer.

A comparison of the number of employees and their earnings in 1902 and 1907 shows a greater relative increase in the case of the municipal than in that of the commercial stations, although the actual increases for the commercial and for the municipal stations should be considered in connection with this statement.

The commercial stations reported approximately seven-eighths of the total number of employees in 1907 and about nine-tenths of the total amount expended for salaries and wages. This appears to indicate that in general the commercial stations pay their employees more liberally than do the municipal stations. This difference holds for both salaried employees and wage-earners, but is most marked in the case of the former. In 1907 the commercial stations reported 87.6 per cent of the total salaried employees and 91.5 per cent of the total salaries. There are two reasons for this difference. In the first place there are connected with the municipal stations no corporation officials who, in the commercial stations, receive the highest salaries of any of the employees. And secondly, many municipal stations reported salaried employees whose time was partly given to other public utilities of the municipality, and only a portion of whose salaries was charged to the operation of the electric station. Similar conditions are, to a greater or less extent, applicable to the wage-earners of the municipal stations, since many of them give part of their time only to the work of the electric plant.

*Supplies and materials.*—Details of the cost of supplies and materials, together with the cost of power purchased, are shown in Table 114.

TABLE 114.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COST OF SUPPLIES AND MATERIALS: 1907 AND 1902.

|                                                                           | TOTAL.       |                  | COMMERCIAL.  |                  | MUNICIPAL.  |                  | PER CENT OF INCREASE. |                  |                 | PER CENT OF TOTAL. |      |            |      |
|---------------------------------------------------------------------------|--------------|------------------|--------------|------------------|-------------|------------------|-----------------------|------------------|-----------------|--------------------|------|------------|------|
|                                                                           | 1907         | 1902             | 1907         | 1902             | 1907        | 1902             | Total.                | Com-<br>mercial. | Munici-<br>pal. | Commercial.        |      | Municipal. |      |
|                                                                           |              |                  |              |                  |             |                  |                       |                  |                 | 1907               | 1902 | 1907       | 1902 |
| Total cost.....                                                           | \$21,400,823 | \$11,280,423     | \$19,665,919 | \$10,303,956     | \$1,734,904 | \$976,467        | 89.7                  | 90.9             | 77.7            | 91.9               | 91.3 | 8.1        | 8.7  |
| Meters:                                                                   |              |                  |              |                  |             |                  |                       |                  |                 |                    |      |            |      |
| Number.....                                                               | 31,900       | 27,632           | 28,024       | 25,739           | 3,876       | 1,893            | 15.4                  | 8.9              | 104.8           | 87.8               | 93.1 | 12.2       | 6.9  |
| Cost.....                                                                 | \$426,625    | \$416,994        | \$378,432    | \$380,569        | \$48,193    | \$26,425         | 2.3                   | 13.1             | 82.4            | 88.7               | 93.7 | 11.3       | 6.3  |
| Motors:                                                                   |              |                  |              |                  |             |                  |                       |                  |                 |                    |      |            |      |
| Number.....                                                               | 4,646        | 602              | 4,522        | 572              | 124         | 30               | 671.8                 | 690.6            | 313.3           | 97.3               | 95.0 | 2.7        | 5.0  |
| Cost.....                                                                 | \$278,410    | \$30,099         | \$270,661    | \$29,202         | \$7,749     | \$897            | 825.0                 | 826.9            | 763.9           | 97.2               | 97.0 | 2.8        | 3.0  |
| Transformers:                                                             |              |                  |              |                  |             |                  |                       |                  |                 |                    |      |            |      |
| Number.....                                                               | 6,762        | 13,288           | 5,468        | 7,843            | 1,294       | 5,445            | 149.1                 | 130.3            | 176.2           | 80.9               | 59.0 | 19.1       | 41.0 |
| Cost.....                                                                 | \$337,706    | \$365,028        | \$288,586    | \$326,407        | \$49,120    | \$38,621         | 17.5                  | 111.6            | 27.2            | 85.5               | 89.4 | 14.5       | 10.6 |
| Incandescent lamps.....                                                   | \$3,191,252  | \$1,507,249      | \$3,042,738  | \$1,426,224      | \$148,514   | \$81,025         | 111.7                 | 113.3            | 83.3            | 95.3               | 94.6 | 4.7        | 5.4  |
| Lamp fittings, etc. (except for arc lamps).....                           | \$762,593    | \$177,236        | \$676,339    | \$154,517        | \$86,254    | \$22,719         | 330.3                 | 337.7            | 279.7           | 88.7               | 87.2 | 11.3       | 12.8 |
| Carbons, globes, hoods, and other supplies for arc lamps and repairs..... | \$1,698,205  | \$1,466,852      | \$1,456,927  | \$1,263,528      | \$241,278   | \$203,324        | 15.8                  | 15.3             | 18.7            | 85.8               | 86.1 | 14.2       | 13.9 |
| Poles and other supports.....                                             | \$757,379    | \$346,587        | \$701,081    | \$319,617        | \$56,298    | \$26,970         | 118.5                 | 119.4            | 108.7           | 92.6               | 92.2 | 7.4        | 7.8  |
| Wire and cable.....                                                       | \$1,769,109  | \$1,152,915      | \$1,623,078  | \$1,081,380      | \$146,031   | \$71,535         | 53.4                  | 50.1             | 104.1           | 91.7               | 93.8 | 8.3        | 6.2  |
| Power purchased.....                                                      | \$7,074,472  | \$2,130,759      | \$6,696,188  | \$2,007,193      | \$378,284   | \$123,566        | 232.0                 | 233.6            | 206.2           | 94.7               | 94.2 | 5.3        | 5.8  |
| Rent of water privileges for water wheels or turbines.....                | \$386,552    | ( <sup>2</sup> ) | \$351,443    | ( <sup>2</sup> ) | \$35,109    | ( <sup>2</sup> ) |                       |                  |                 | 90.9               |      | 9.1        |      |
| All other materials.....                                                  | \$4,436,728  | \$2,566,341      | \$3,993,181  | \$2,365,807      | \$443,547   | \$200,534        | 72.9                  | 66.8             | 121.2           | 90.0               | 92.2 | 10.0       | 7.8  |
| Freight, not included in cost of materials.....                           | \$281,792    | \$1,120,363      | \$187,265    | \$939,512        | \$94,527    | \$180,851        | 174.8                 | 180.1            | 147.7           | 66.5               | 83.9 | 33.5       | 16.1 |

<sup>1</sup> Decrease.

<sup>2</sup> Not reported separately in 1902.

The total cost of supplies, materials, etc., shows a somewhat larger percentage of increase than do salaries and wages, and the commercial stations show a larger per cent of increase in the total cost of supplies and materials than do the municipal stations. The

commercial stations reported a smaller amount as paid for meters and transformers in 1907 than in 1902. The amounts reported for these two items at the two censuses are of doubtful value for purposes of comparison, because of the uncertainty as to whether



the questions were answered with the same understanding as to their meaning. In connection with the canvass of 1907 it was found that many stations had included, under supplies and materials, the cost of meters and transformers that had been used in connection with new work and which should have been reported under the cost of construction during the year. In 1902, when the first census of electric stations was taken, errors of this kind may have been overlooked, for it seems improbable that, in view of the increased use of meters and the general replacement of small and worn-out transformers by larger and better ones, the total cost of these machines, which could properly be classed as "Cost of supplies and materials," should be less in 1907 than 1902.

For purposes of comparison the amounts reported as paid for freight in 1907 and 1902 are of no value, be-

cause of the fact that some stations keep a separate account of freight charges and others reckon these charges in with the cost of supplies received. Thus the amounts reported are simply such part of the total freight charges as were kept separate from the cost of supplies and materials.

Of all the different items included under expenditures for supplies and materials, the cost of motors shows the largest percentage of increase. The amount paid for incandescent lamps more than doubled, and the amount paid for fittings for lamps of this character shows a still larger percentage of increase. The amount paid for carbons, globes, etc., for arc lamps was but little more in 1907 than in 1902.

*Fuel.*—The cost of fuel, which is reported as a single item in the foregoing tables of this report, is shown in detail in Table 115.

TABLE 115.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—COST OF FUEL: 1907 AND 1902.

|                       | TOTAL.       |              | COMMERCIAL.  |              | MUNICIPAL.  |             | PER CENT OF INCREASE. |                       |                 | PER CENT OF TOTAL. |      |            |      |
|-----------------------|--------------|--------------|--------------|--------------|-------------|-------------|-----------------------|-----------------------|-----------------|--------------------|------|------------|------|
|                       |              |              |              |              |             |             |                       |                       |                 | Commercial.        |      | Municipal. |      |
|                       | 1907         | 1902         | 1907         | 1902         | 1907        | 1902        | Total.                | Com-<br>mer-<br>cial. | Munici-<br>pal. | 1907               | 1902 | 1907       | 1902 |
| Total.....            | \$23,057,745 | \$11,635,509 | \$19,824,962 | \$10,189,665 | \$3,232,783 | \$1,445,824 | 98.2                  | 94.6                  | 123.6           | 86.0               | 87.6 | 14.0       | 12.4 |
| Coal.....             | 19,681,212   | 9,943,125    | 16,780,874   | 8,749,394    | 2,900,336   | 1,193,731   | 97.9                  | 91.8                  | 143.0           | 85.3               | 88.0 | 14.7       | 12.0 |
| Crude petroleum.....  | 2,171,547    | 721,838      | 2,043,000    | 700,136      | 128,547     | 21,702      | 200.8                 | 191.8                 | 492.3           | 94.1               | 97.0 | 5.9        | 3.0  |
| Natural gas.....      | 299,648      | 254,269      | 259,181      | 220,460      | 40,467      | 33,809      | 17.8                  | 17.6                  | 19.7            | 86.5               | 86.7 | 13.5       | 13.3 |
| Manufactured gas..... | 194,816      | 28,654       | 194,816      | 20,135       | .....       | 8,519       | 579.9                 | 867.5                 | .....           | 100.0              | 70.3 | .....      | 29.7 |
| All other fuel.....   | 710,522      | 687,623      | 547,091      | 499,560      | 163,431     | 188,063     | 3.3                   | 9.5                   | 113.1           | 77.0               | 72.7 | 23.0       | 27.3 |

<sup>1</sup> Decrease.

Both in 1902 and 1907 approximately seventeenth-twentieths of the total cost of fuel reported represented the cost of coal. Crude petroleum was next in importance, the percentage which the cost of this fuel represented of the total cost increasing from 6.2 in 1902 to 9.4 in 1907. The cost of the three remaining classes of fuel shown formed but 5.2 per cent of the total cost of fuel in 1907 as compared with 8.3 per cent in 1902.

All of the amount paid in 1907 for manufactured gas was reported by the commercial stations, but for natural gas the proportion of the total represented by each of the two classes of stations at the two censuses varied but little from the proportions shown for coal. The use of crude petroleum appears to have been chiefly confined to the commercial stations, which reported 94.1 per cent of the total cost of this kind of fuel reported in 1907 and 97 per cent in 1902.

The states in which the central stations reported an expenditure for coal amounting to more than \$1,000,000 were as follows: New York, \$2,980,946; Illinois, \$1,997,418; Pennsylvania, \$1,899,829; Massachusetts, \$1,344,354; and Ohio, \$1,215,778. The states in which the stations reported more than \$100,000 as spent for crude petroleum were: California, \$945,251; Texas, \$728,343; and Arizona, \$167,922. Among the largest users of natural gas, with the amount spent

for this fuel in 1907, were: Ohio, \$83,979; Pennsylvania, \$67,923; Kansas, \$52,424; Oklahoma, \$29,557; and West Virginia, \$29,401. No large amount was reported by any state as spent for manufactured gas, except by California, the stations in which state reported \$150,407 or 77.2 per cent of the total amount reported for this class of fuel. Expenditures for "All other fuel," while general among the stations in the various states, were largest in those states having an abundance of timber.

*Power purchased.*—This constitutes the smallest of the several items of expense shown in Table 106, but shows the largest rate of increase, 232 per cent. Expenditures for electric current naturally form the greater part of this item, amounting to \$6,417,237 in 1907 and \$1,300,925 in 1902, a gain of \$5,116,312, or 393.3 per cent. The expenditure for other power—steam, water, etc.—amounted to \$657,235 in 1907 as compared with \$829,834 in 1902. Although the reported expenditure for other power was less in 1907 than in 1902, it is probable that there was no actual decrease, since the amount for 1902 included the cost of water for water wheels and turbines, which was, in 1907, not included with the cost of power purchased, and which amounted in that year to \$386,552.

The following states reported the largest amounts for power purchased in 1907: New York, \$2,105,944;



Pennsylvania, \$744,378; California, \$693,953; Michigan, \$630,532; Washington, \$365,111; Missouri, \$337,859; Massachusetts, \$295,442; and Illinois, \$263,848.

In 1907 there were 414 stations which reported the purchase of power as compared with 128 in 1902. Of the number reporting in 1907, 165 both generated and purchased current, and of the number reporting in 1902, 41 did the same. Moreover, a number of sta-

tions were found which, though fitted with dynamos, did not operate them, but purchased the current used. In 1907 there were 26 stations of this character, with a dynamo capacity of 15,688 kilowatts, as compared with 15 stations in 1902, with a dynamo capacity of 5,035 kilowatts.

*Miscellaneous expenses.*—Details of the expenses included in the last item of Table 106 are shown for the commercial and municipal stations in Table 116.

TABLE 116.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—MISCELLANEOUS EXPENSES: 1907 AND 1902.

|                                                               | TOTAL.       |              | COMMERCIAL.  |              | MUNICIPAL. |           | PER CENT OF INCREASE. |                       |                 | PER CENT OF TOTAL. |      |            |      |
|---------------------------------------------------------------|--------------|--------------|--------------|--------------|------------|-----------|-----------------------|-----------------------|-----------------|--------------------|------|------------|------|
|                                                               |              |              |              |              |            |           |                       |                       |                 | Commercial.        |      | Municipal. |      |
|                                                               | 1907         | 1902         | 1907         | 1902         | 1907       | 1902      | Total.                | Com-<br>mer-<br>cial. | Muni-<br>cipal. | 1907               | 1902 | 1907       | 1902 |
| Total.....                                                    | \$26,326,257 | \$11,895,206 | \$25,611,771 | \$11,456,037 | \$714,486  | \$439,169 | 121.3                 | 123.6                 | 62.7            | 97.3               | 96.3 | 2.7        | 3.7  |
| Rent of stations, line-wire sup-<br>ports, conduits, etc..... | 2,322,753    | 1,011,691    | 2,317,099    | 1,001,504    | 5,654      | 10,187    | 123.6                 | 131.4                 | 144.5           | 99.8               | 99.0 | 0.2        | 1.0  |
| Rent of offices.....                                          | 577,193      | 275,007      | 596,472      | 270,446      | 10,721     | 4,561     | 109.9                 | 109.5                 | 135.1           | 98.1               | 98.3 | 1.9        | 1.7  |
| Taxes.....                                                    | 6,351,020    | 2,665,005    | 6,345,796    | 2,654,885    | 5,224      | 10,120    | 138.3                 | 139.0                 | 148.4           | 99.9               | 99.6 | 0.1        | 0.4  |
| Injuries and damages.....                                     | 634,991      | 248,304      | 602,523      | 246,545      | 32,468     | 1,759     | 155.7                 | 144.4                 | 1,745.8         | 94.9               | 99.3 | 5.1        | 0.7  |
| Insurance.....                                                | 1,578,205    | 893,567      | 1,467,936    | 827,926      | 110,269    | 65,641    | 76.6                  | 77.3                  | 68.0            | 93.0               | 92.7 | 7.0        | 7.3  |
| Ordinary repairs of buildings and<br>machinery.....           | 4,300,684    | 2,701,747    | 3,986,586    | 2,490,217    | 314,098    | 221,530   | 59.2                  | 60.7                  | 41.8            | 92.7               | 91.8 | 7.3        | 8.2  |
| All other expenses not elsewhere<br>reported.....             | 10,561,411   | 4,099,885    | 10,325,359   | 3,974,514    | 236,052    | 126,371   | 157.6                 | 159.8                 | 88.3            | 97.8               | 96.9 | 2.2        | 3.1  |

<sup>1</sup> Decrease.

More than nineteen-twentieths of the total for these miscellaneous expenses was reported by the commercial stations and less than one-twentieth by the municipal stations. Of the expense for ordinary repairs of buildings and machinery and for insurance, the proportions for the two classes of stations were practically the same in 1907 as in 1902, or more than nine-tenths for the commercial stations and less than one-tenth for the municipal. Expenditures for ordinary repairs are common to the two classes of stations, though necessarily varying in proportion to the age

and condition of the plant and the standard to which it is kept up. The proportion of "All other expenses not elsewhere reported," paid by the municipal stations was relatively small, as might be expected, since these stations have much less occasion for expenditures for many of the items included under this head, such as advertising, interest, law expenses, etc., than have the commercial stations. The municipal stations also reported relatively insignificant amounts as paid for the rent of stations, line-wire supports, etc., office rents, and for taxes.

## CHAPTER VIII.

### TECHNICAL ASPECTS OF THE PERIOD.

By THOMAS COMMERFORD MARTIN, Expert Special Agent.

*General conditions.*—The report on central electric light and power stations for 1902 embraced a historical review of their development and discussed the apparatus in use at that time for the generation of electrical energy and for its distribution and consumption, including dynamos, motors, transformers, arc and incandescent lamps, and other appliances. It is not necessary, therefore, to consider again these phases in the growth of the electric light and power industry; and the present discussion will be limited to the evolution that has taken place since 1902. There have been changes in every branch of the industry, some of which have been extreme, and the approach of a few of which was indicated in the former report. In one or two instances the introduction of new methods or appliances was unexpected. The changes in the technical aspects of the industry have kept pace with those in its financial and physical aspects. Virtually doubling itself every five years, in the latter respects, the central-station industry displays as yet no symptoms of settling down into a condition of satisfaction with the present which would be obstructive of improvement. Indeed, the notable tendency toward the consolidation of small individual stations into large "systems" with extensive networks has brought with it the wholesale "scrapping" of plants and apparatus and the installation of generating and consuming appliances of far higher efficiency and economy, in order to meet the demand on the part of the public for cheaper and better service.

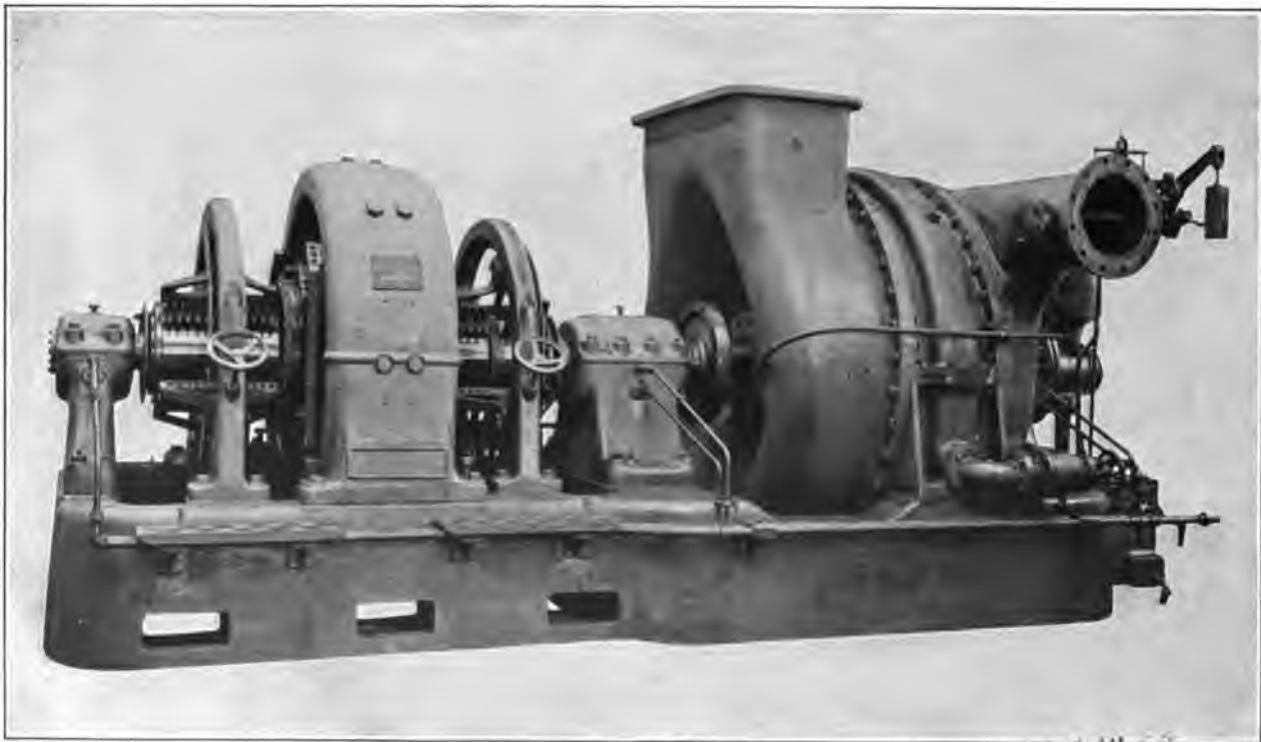
A typical case is that of the Boston Edison Company, whose system in 1885 covered an area of one-eighth of a square mile, and at present covers an area of 509 square miles—the increase being due chiefly to expansion during the period 1902–1907. The map presented herewith, showing some of its circuits, reveals the details of that vastly larger area in which it is now operating, within which lie 35 cities and towns of Massachusetts, with a combined population of approximately 1,000,000 inhabitants. Included in this territory are 2,197 miles of streets, 1,016 miles of which are covered by the lines of the company. Within the region are 34,428 customers, requiring a supply of current up to 100,000 kilowatts, equivalent to two million 16-candlepower lamps. Originally the engines in the

generating plant were of 90 horsepower, but they have been displaced by steam turbines of 16,000 horsepower each; while generators of 20-kilowatt capacity have been succeeded by generators of 12,000-kilowatt capacity. All this development has taken place within a period of about twenty-five years, and similar development is shown in other large centers of population, such as those served by the Public Service Corporation in New Jersey and the Pacific Gas and Electric Company in California.

Another salient feature of the period 1902–1907 is the increasing resort to water power as a source of primary energy. The statistics in Chapter III on power equipment show that the number of steam engines, including steam turbines, in central stations increased from 5,930 in 1902, with a total of 1,379,941 horsepower, to 7,206 in 1907, with 2,627,450 horsepower. Practically all these engines were located within the corporate limits of towns and cities, and the increase in capacity during the five-year period was nearly 100 per cent. But the development in water power due to the establishment of perhaps not less than 300 hydro-electric power transmission enterprises is much more striking. The water wheels reported show an increase from 1,390 in 1902 to 2,481 in 1907, while their capacity increased from 438,472 horsepower to 1,349,087 horsepower, more than threefold. It is not to be understood that all this hydro-electric power is specifically employed in central station lighting and power, as a great deal of it is furnished to electric railways and isolated mills and mines. But the power-transmission company is generically a central-station plant, and all such companies and systems are included in the present statistics where they affect the totals and the analytic deductions in many important respects, as, for example, in the average price obtained per kilowatt hour. It is obvious, upon a moment's consideration, that a transmission company can sell its product at a lower rate than a central station which in its price per kilowatt hour to the customer has to include free supply of lamps, or arc carbons and globes, labor, inspection, etc. The apparent return per kilowatt hour as given in this report is thus too low, from the central-station standpoint, and would naturally be higher after the deduction of a very large but inde-



INTERIOR VIEW OF SOUTHERN POWER COMPANY'S HYDRO-ELECTRIC PLANT.



HORIZONTAL LOW-PRESSURE STEAM TURBINE AND GENERATOR.

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terminate quantity of electrical energy sold in bulk by the power company, almost invariably at a price below what the same power would cost the receiving central-station company, or individual consumer, if it were produced by steam at or near the point of utilization.

This development of remote water powers for purposes of electrical transmission is recognized as one of the questions of the time, and was given special study by the conservation conference held at the White House in 1908, on invitation of President Roosevelt. In a report<sup>1</sup> to this conference, made by Mr. H. St. Clair Putnam, it was stated that of the total estimated power produced in the United States in 1907, about 26,000,000 horsepower was credited to steam engines, 800,000 horsepower to gas and oil engines, and 3,000,000 horsepower to water motors. It will be seen from these figures that nearly half the utilized water power of the country is subject to central-station conditions and control, and the proportion belonging to hydro-electric power is in reality much larger, as several hundred small electric plants not engaged in the sale of electricity, but connected with various manufactories, employ water power. Mr. Putnam said:

During the past few years there has been renewed interest in water powers on account of the practicability of their use for the generation of power and the electrical transmission of this power to distant markets. The great hydro-electric development at Niagara was the first large enterprise of this character and has demonstrated its practicability. The census of 1902 gives a partial list of long-distance hydro-electric plants developing power aggregating 600,000 horsepower; and this list can now be largely increased. Our most desirable water powers are being absorbed rapidly, and it becomes important, therefore, for us to take stock of our water resources and formulate plans for their control and proper utilization.

The recognition of the importance of water-power development has grown since the conference was held, and the proper methods of dealing with water powers and maintaining public control and interest in them have become a distinct problem for the National Government, as well as one of the topics most agitated in the press.

*Steam power.*—The figures in Chapter III show striking changes in the use of steam power in central stations since the report of 1902. At that time, owing to the fact that steam turbines had not been installed in any considerable degree, they were not reported separately. In the present report they are credited with 19.9 per cent of the total horsepower reported and 31.1 per cent of all the steam power. Few revolutions in the mechanical world have been more rapid and sweeping. The relative size of the units is also significant, for while the reciprocating engines averaged 265 horsepower in 1907, the turbines averaged 2,168 horsepower, or eight times as much.

<sup>1</sup> Proceedings of a Conference of Governors, published by authority of Congress, 1909, p. 292.

Only one or two of the recently equipped central stations with large generating units have installed reciprocating engines. The most notable instance is the Redondo generating station of the Pacific Light and Power Company of California, which has been equipped with reciprocating engines of the latest type. The plant has a nominal rating of 15,000 kilowatts in three equal units, which generate current at the extremely high electro-motive force of 18,000 volts, for which the dynamos are wound. There are three 34 and 70 inch by 56 inch combined double horizontal and vertical compound side-crank automatic engines, each direct-connected to one of the 50-cycle 3-phase alternators of the fly-wheel type. The fuel used is crude petroleum. On a total output of not less than 60,000 kilowatt hours per 19.5 hours running for fifteen days, there being 4.5 hours of "stand-by" idleness each day, the contractor guaranteed an output of 170 kilowatt hours per barrel of oil weighing 334 pounds, each pound delivering 18,500 British thermal units. The actual test showed 252.8 kilowatt hours per barrel; and a bonus of \$363,310 was earned by the contractor as a result of this remarkable economy and efficiency. It is stated that the first cost of the plant did not exceed by 5 per cent that of a steam-turbine plant.

No other large new central station with reciprocating engines can be named. The whole drift seems to be toward large steam turbines or large gas engines, where water power is not available, or even as a reserve where the uncertainty of water power renders some auxiliary power necessary. Chicago and New York have both furnished examples. The New York Edison Company now has both its great Waterside stations in operation side by side on the East River, with an aggregate maximum rating of 330,000 horsepower, in 24 units of 169,500 kilowatts. Waterside No. 2 began operations in November, 1906, and although reciprocating units were first contemplated, it now contains six 8,000-kilowatt vertical turbo-generators, two 7,500-kilowatt horizontal turbine units, and two 14,000-kilowatt vertical units, which comprise the entire equipment of this huge station. Waterside No. 1, which began operations in October, 1901, and was intended to hold sixteen 3,500-kilowatt reciprocating engine units, has now eleven such units, together with three 10,000-kilowatt and two 5,000-kilowatt vertical turbine units.

The new Quarry Street station of the Commonwealth Edison Company of Chicago, constructed just across the south branch of the Chicago River from the Fisk Street station, illustrated in the report of 1902, constitutes, with its initial rating of 28,000 kilowatts in two units, a fit supplement to the latter station, the pioneer great steam turbine power house in this country. It is significant of the rapid march of events that the first four turbo-generators in the Fisk Street station, only five years old, were replaced in the summer of 1909 by an equal number of 12,000-

kilowatt units, which change increases the Fisk Street station rating by 22,000 kilowatts without any addition in the boiler room except the extension of two stacks and slightly increased grate surface.

A further development in the use of primary power has been the practice in high-pressure steam generating plants to resort to low-pressure steam turbines which run on the exhaust steam of reciprocating engines, and this practice appears to have been quite successful. In a paper on the subject<sup>1</sup> read at Atlantic City in June, 1909, before the National Electric Light Association, Mr. C. H. Smoot cited several instances, and said: "I strongly suggest that owners of noncondensing plants consider the opportunity of utilizing the exhaust of their reciprocating engines in low-pressure steam turbines, and thereby adopt a method of rejuvenating their plants by one of the most efficient methods of developing power from steam."

*Oil engines.*—The Pittsfield (Mass.) Electric Company has put in regular service an interesting oil-driven plant to supplement its older steam plant, which also does a large exhaust-steam heating business in the cold season. The fuel used is crude petroleum. A side track of the Boston and Albany Railroad extends parallel to the north wall of the station, and all the fuel oil is handled upon this spur. Oil is stored outside the plant in three 6,000-gallon tanks. These tanks are filled by gravity from the oil cars run upon the siding, and from the tanks the oil is piped into the basement of the power house. Water for cooling the jackets and bearings of the machinery in the station is drawn from a neighboring pond through an 18-inch pipe, which terminates in a well about 60 feet inland from the shore. From the well a triplex pump in the basement draws and delivers the water as needed in the plant.

The generating unit is a 350-kilowatt, 60-cycle, 2,300-volt, 2-phase revolving-field alternator mounted on a shaft midway between two 16-inch by 24-inch 3-cylinder oil engines. The normal speed of this unit is 164 revolutions per minute. It is governed by by-passing the oil supply back into the suction side of the oil pump. In general design and appearance the engine follows the lines of a vertical inclosed type of steam engine. The action is on the 4-stroke cycle, but the engine differs from all previous internal-combustion engines in compressing a full charge of air to a point above the igniting point of the fuel, whether liquid or gaseous, and then injecting this fuel for a certain period, variable according to the load, into this red-hot air, where it burns under controlled limits of temperature and pressure. The cylinder operation is therefore one of combustion rather than explosion. Each engine is rated at 225 horsepower, weighs 80,000 pounds, and has the following over-all dimensions: Floor space, 9 feet 6 inches by 16 feet 6 inches; height,

12 feet. Foundation dimensions: Width of top, 10 feet; bottom, 12 feet; length, 20 feet; height, 7 feet, 1 inch. The latter dimensions include the space required by a direct-connected engine-type generator.

*Gas engines.*—A notable development in the generation of current has been the resort in San Francisco to very large gas engines by the California Gas and Electric Corporation. Its three engines, each of 5,333 horsepower, connected to the alternating-current generators, have the following dimensions: Length over all, 70 feet; width over all, 34 feet; weight of heaviest casting, 60 tons; diameters of cylinders, 42 inches; length of stroke, 60 inches; main journals, 30 inches diameter, 54 inches long; main crosshead gibs, 27 inches wide, 54 inches long; diameter of center of shaft, 38 inches; weight of fly wheel, 130,000 pounds; total weight of engine, fly wheel, and generator, 1,200,000 pounds. In general design and detail the gas engines resemble modern high-grade, massive steam engines. They are horizontal, twin-tandem, double-acting, 4-stroke cycle, giving two impulses to each crank per revolution. Each of the electric generating units can deliver 4,000 kilowatts at 13,000 volts, 25 cycles.

It is recognized that the gas engine itself is successful in large sizes for generating plants, but that the intrinsic efficiency of such plants depends on the gas producer, and upon the economical gasification of low grades of fuel. As has been said, the producer in its best form is the means of making available the high thermal efficiency of the gas engine to many central stations, and is the chief factor that warrants the installation of this type of prime mover at a greater installation cost than that of a steam plant. There are now producers on the market that can be relied upon to produce a satisfactory gas from many of the low grades of coal available in different sections of the country; and the result is shown, in part, in the increase in the number of gas engines from 165 in 1902 to 463 in 1907, and in their capacity from 12,181 horsepower to 55,828 horsepower.

As an illustration of complex conditions, the Keene Gas and Electric Company, of Keene, N. H., may be cited, which uses gas, steam, and water power in three separate plants. The company's gas plant, distant only 1½ miles from the business center, contains two 250-horsepower anthracite gas producers and three gas engines of the vertical three-cylinder type, the two smaller engines being each connected to an 80-kilowatt alternator, and the largest unit to a 110-kilowatt alternator. The fuel requirements are less than in a steam plant of equal capacity, and the fuel feeding and ash discharging for the producer are accomplished by the action of gravity alone.

*Water power.*—The statistics in Chapter III as to water power are clearly indicative of the general trend of practice. An immense increase is shown both in the number and size of water wheels. In 1902 there were 1,390 water wheels, having a capacity of 438,472

<sup>1</sup> Proceedings, National Electric Light Association, 1909, Vol. II, p. 232.



SWITCHBOARD ROOM, QUARRY STREET STATION, COMMONWEALTH EDISON COMPANY, CHICAGO.



STEAM TURBINE GENERATING PLANT, FISK STREET STATION, COMMONWEALTH EDISON COMPANY, CHICAGO.

1900



horsepower, while in 1907 there were 2,481, having 1,349,087 horsepower. Thus the size per unit rose from an average of about 315 horsepower to 544 horsepower. The units are classified as "water wheels," but in practically every instance a more correct designation would be "turbine." In compiling the statistics, no attempt was made to differentiate between impulse and reaction types, or between installations as having horizontal or vertical shafts; although all these features have necessarily an intimate relationship to the character of the electrical generator associated with the driving wheel.

The most notable developments of the period 1902 to 1907 have been those at Niagara Falls and those in the Sierras of California; but in every part of the country where water powers lay undeveloped, enterprises on a large scale have been set on foot for the purpose of hydro-electric generation and power transmission. In fact, the period named may be regarded as one of great speculative activity in this respect, with the result that many plants have come into existence that remain unprofitable, either because the work has been too costly, because there is little market for the energy when developed, or because the problems of economical and uninterrupted transmission have not been mastered.

A water-power plant of somewhat unusual character is that of the Indiana and Michigan Electric Company, on the St. Joseph River at Berrien Springs, Mich., serving northwestern Indiana and southwestern Michigan. It was built during the intercensal period and placed in service during 1908, and is of the low-head system, capable of producing 7,200 kilowatts. The company has a total of 25,000 horsepower in its steam and water power plants, the four of the latter all being on the St. Joseph River. This river has a maximum flow of only about twenty-five times the minimum, and the actual head at Berrien is only 21 feet, gained by backing up the flow for more than 10 miles by a dam nearly one-third of a mile long, the back flow extending to the next plant above. The power house stands lengthwise to the dam. The low head made necessary considerable complication in the water-wheel plan. Each of the four generators installed is driven by a group of four pairs of wheels working under a normal head of 20 feet. The generators, rated at 1,800 kilowatts each, 60 cycles, are driven at 150 revolutions per minute. The river runs over and through a mass of glacial drift, with a hardpan bottom, and to prevent loss of water by flow under the apparent bottom of the river, a continuous line of sheet-steel piling was driven in clear across the river down to hardpan, under the upstream side of the dam; while a similar defense of mail was put across the downstream side to prevent any backwash. These elaborate precautions were taken primarily to prevent the passage of water under the dam or the scouring of the river bed below the latter, and thus preclude any possibility of undermining the structure.

Another plant of somewhat unusual character is that put in operation in 1907 by the Patapsco Electric and Manufacturing Company, of Ellicott City, Md., whose power house on the Patapsco River about 10 miles west of Baltimore is built entirely within the dam and is thus completely under water. The same structure thus serves both as dam and as power house; the available fall is utilized, and with slight modifications the suction force of the spillway water as it rushes over the mouth of the tailrace may be employed to increase the effective head by lowering the water level in the race well. With power houses as ordinarily constructed below the dam, the contrary effect obtains. Abundant natural light is had through windows located on the downstream side of the dam, beneath the falls, and natural ventilation is also provided. The generating alternators when under load furnish sufficient heat to dispel any dampness that may manifest itself; and, although somewhat restricted as to space, the power house is as comfortable as any other station building of like capabilities. The plant has a capacity of 600 kilowatts, with provision for another 300-kilowatt unit, and the electrical energy is employed for lamps and motors.

The structure represents the latest development in dam design. Heretofore, solid masonry has been considered the only safe and permanent device to impound water, reliance being placed on the enormous weight of the dam to resist the water pressure. At Ellicott City the water pressure is utilized to maintain the position of the dam, the upstream side being so proportioned and shaped that the weight of the water upon it equals the horizontal-pressure component. The dam is merely a shell in which the necessary rigidity and strength are secured by a very small fraction of the material needed in the old-style construction. The deck and apron are supported on buttresses and have a section just sufficient to resist bending under water pressure, a large factor of safety, of course, being allowed. The structure may be built in considerably less time than a solid dam, and the interior may be utilized, as in this instance, for housing the electrical equipment. In 1907 two plants of the same character as that at Ellicott City were begun, one at Delta, Pa., and the other on the Big Horn in Wyoming—each having a head of water of about 60 feet and developing about 1,500 kilowatts.

No inconsiderable amount of modern hydro-electric development in the West is associated with irrigation work. One of the most noteworthy and recent examples is connected with the Custer reservoir in San Miguel and Dolores counties, Colo., where a dam 110 feet high impounds 756,800 acre-feet of water, to be employed in power development and irrigation. Another work of this character, which has been under construction for some time and will be completed before April, 1910, is the Orchard Mesa irrigation project, extending from Grand Junction to Palisade, in the richest fruit district of Colorado.

During 1906-7 the municipality of Lynchburg, Va., installed a plant which is somewhat typical of the older methods, in that the current is not transmitted a long distance, and that the energy is employed for ordinary arc-lighting purposes. This plant utilizes the flow of the James River, and occupies an old pumping station that was part of the municipal water-works before the new gravity system was introduced. An operating head of only 12 feet has been skillfully employed. The plant is laid out for the use of series alternating current, to avoid the use of transformers between the generators and the series circuits. The generating dynamos are 2-phase alternators designed to supply 15 amperes per phase at 4,200 volts. The arc lamps are supplied with 7.5 amperes at 80 volts. This gives two circuits per phase, with 50 lamps on each circuit, or 200 lamps per generator. An inductive regulator is placed in each circuit which will automatically maintain a constant current of 7.5 amperes through the lamps.

Niagara remains, of course, the preeminent example of hydro-electric development in the United States. Grouped around the great falls are seven generating stations, whose supply of electrical energy is in demand over a very large area of consumption. Figures reported for 1908-9<sup>1</sup> show that the energy from Niagara Falls is used at the rate of 126,800 horsepower for electro-chemical processes, 56,200 horsepower for railway service, 36,400 horsepower for lighting, and 54,640 horsepower for various industrial services, or a total of 274,040 horsepower. Since the water of Niagara Falls represents probably more than 5,000,000 horsepower, it would seem that only about 5 per cent of the available power is being utilized at present. As to the proportion of energy from Niagara Falls used locally as compared with that transmitted elsewhere, figures in the article referred to above show that 12,300 horsepower is transmitted more than 100 miles; 33,500 horsepower, 75 miles and less than 100; 3,100 horsepower, 50 miles and less than 75; 79,640 horsepower, 10 miles and less than 50; while 145,400 horsepower is used locally on the Canadian and New York sides of the falls. That is to say, somewhat more than 50 per cent of the energy actually utilized is employed locally, and almost all of this is used in industries that have been attracted to Niagara Falls by reason of the generating stations located there. Electro-chemical processes take 87 per cent of the energy that is consumed locally and 46 per cent of the total amount utilized.

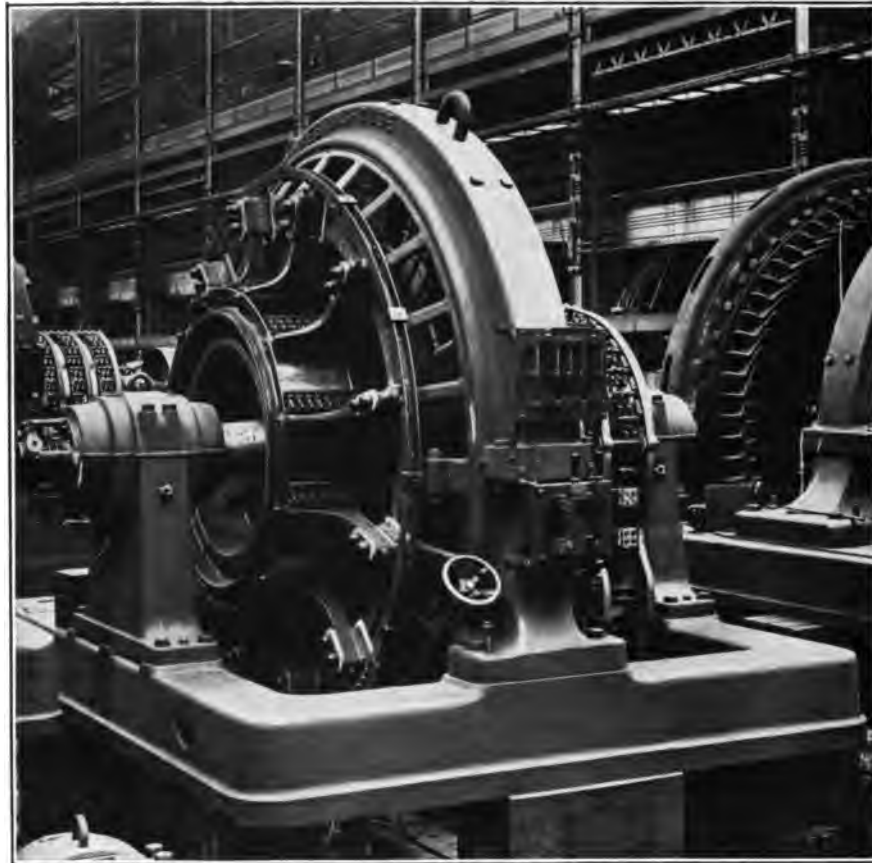
What is believed to be the largest turbine of its type ever built is that put in operation during 1905-6 by the Seattle and Tacoma Company at its Snoqualmie Falls plant, 35 miles east of Seattle, Wash., a single-wheel turbine of 10,000 horsepower capacity. The 12,500 horsepower vertical turbines of the Electrical Development Company, the 10,000 horsepower horizontal turbines of the Ontario Power Company, and the

10,000 horsepower vertical turbines of the Canadian Niagara Power Company, all of which are at Niagara Falls, Ontario, are duplex machines, as each unit has two runners on a single shaft driving a single generator. The Snoqualmie Falls turbine, with but one wheel, therefore, represents by far the largest concentration of power yet accomplished in turbine water wheels. The turbine in question is employed in an enlargement of the Snoqualmie Falls plant to double its original capacity.

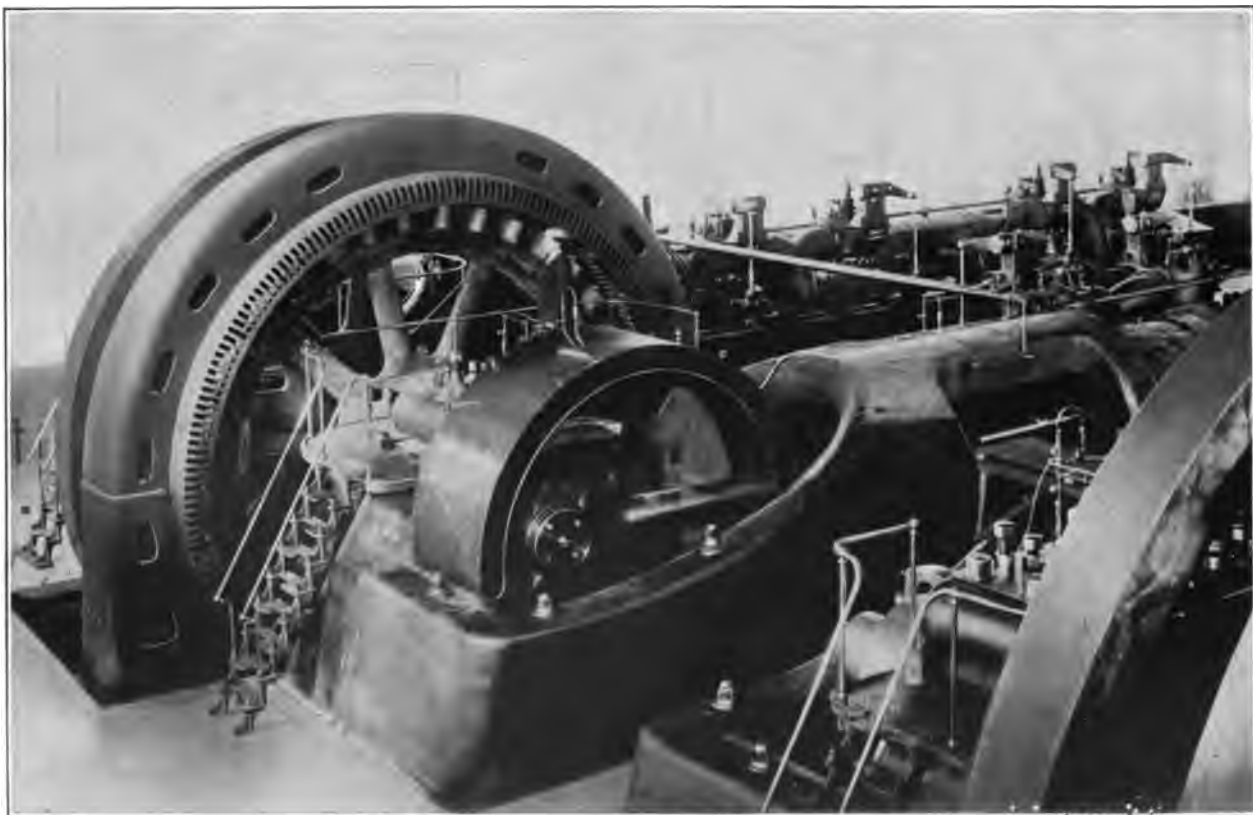
*Generators.*—The statistics of Chapter III are very complete as to the generator, or dynamo, equipment of American central stations in 1907, and reveal clearly the changes that have taken place and are still in progress in the manner of generating electric current. At one time the central stations of the country were wholly on the basis of direct current for incandescent lighting, arc lighting, and motor supply, and direct-current generators predominated to the exclusion of any other type. Now the vast majority of stations are on the basis of alternating current, even if they deliver direct current to the consumption devices. As shown by Table 34, there were in use in 1907 for generating direct current, either of constant voltage or of constant amperage, 5,365 dynamos of a total capacity of 487,452 kilowatts, as compared with 6,808 machines of 2,221,773 kilowatts capacity employed to generate alternating current. In 1902 the alternating-current dynamo was already in the lead as to capacity, though somewhat inferior as to number; but the five years witnessed a remarkable diminution in the number and capacity of dynamos of constant amperage designed strictly for the old arc-lighting service, and in reality capable of nothing else. The number fell off from 3,539 to 1,685, and the capacity from 145,866 kilowatts to 80,992 kilowatts; and it is probable that during the period in question few, if any, new machines of the old type were built. If there were any new machines intended specifically for arc-lighting purposes, they will be found in the alternating-current group, where their presence tended to keep down the average capacity per unit to 326 kilowatts, although this is far above the average per alternating unit shown for 1902, which was below 144 kilowatts.

Thus the interesting and significant fact emerges that although the generator capacity in the five years more than doubled, rising from 1,212,235 kilowatts to 2,709,225, the number of dynamos actually declined from 12,484 to 12,173. How far this concentration will go it is hard to say, but the tendency is plainly visible. At the beginning of 1908, for example, there were 345 central stations in New York state. It has been conservatively estimated that with the methods and apparatus now in use for generating, transmitting, and distributing current, the whole state could be much more economically and efficiently supplied from 10 stations each with a radius of about 50 miles. This being true, it is obvious that hundreds of the smaller dynamos would disappear and their work be

<sup>1</sup> Electrical World, October 21, 1909, p. 978 et seq.



1,500-KILOWATT ROTARY CONVERTER.



GENERATOR CONNECTED TO LARGE GAS ENGINE, SAN FRANCISCO.

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done by relatively few machines of greatly increased capacity. The radical modifications of all kinds that would follow such a change in generating methods, which is entirely feasible, lie beyond the scope of this report.

Of late years there has been little development in the design of such direct-current machinery as is included in this report, and what has been done aims rather at refinement and perfection than the adoption of new ideas. All the real work of development is concentrated on the alternating-current types, especially those driven at high speed by steam turbines. The size of 3-phase alternating-current dynamos has been carried as high as 14,000 kilowatts, with an overload capacity 50 per cent above normal rating. These generators have a frequency of 25 cycles per second and produce current at 11,000 volts pressure, usually for delivery to rotary converters which so manipulate it as to make it possible for lamps and motors on the circuit to use direct current at a low safe pressure. Such a machine is capable of energizing to full brilliancy 560,000 tungsten incandescent lamps of 25 watts and 20 candlepower, giving a total light equal to 11,200,000 candles.

Where such a machine is to furnish current for lighting rather than for motors, it is usual to employ a frequency of 60 cycles, as with a lower frequency there is an appreciable flicker in the lights. Dynamos of such design are operated either horizontally or vertically, and either the armature or the field magnets may be revolved. A revolving-field generator of 14,000-kilowatt capacity is among more recent developments, operating at 6,600 volts, 60 cycles, 3-phase, direct-connected to the vertical shaft of a steam turbine running at a speed of 720 revolutions per minute. This huge machine has a peripheral speed of 18,300 feet per minute and an output per pole of 1,400 kilowatts, as compared with a peripheral speed of 8,000 feet per minute and an output per pole of 150 kilowatts in a reciprocating engine-driven alternator of the same capacity and frequency, operating at 75 revolutions per minute. The electrical and magnetic losses in the field and armature of such a machine of 14,000-kilowatt capacity amount to about 350 kilowatts, and to conduct this heat away from it in order to prevent local high temperature requires about 140,000 cubic feet of air per minute at usual dynamo-room temperatures. In order to regulate the movement of the ventilating air, the generator is entirely closed, with the exception of the intake and discharge openings at the top and bottom of the armature. Thus when the machine is running, its revolving field operates as a powerful fan. Air received through the openings in the ventilating hood is forced through passages provided in the field and the armature, and discharged at the openings in the base of the generator.

Now that so much of the current is generated by alternators, a large quantity of auxiliary apparatus is

required of various forms. In the smaller plants the transformer capacity for lowering the potential is usually from 50 to 75 per cent greater than that of the generating apparatus, while in many of the larger systems, it is stated, the combined capacity of the converting and transforming apparatus is approximately three times as great as that of the generators. Transformers will be dealt with later; but reference may be made here to the apparatus which is of a generating character in design although it adds nothing to the capacity of the plant, simply rendering the energy produced more available for miscellaneous use. Thus current is often changed in voltage or phase and frequency changers have been widely adopted. These may be either synchronous or nonsynchronous, depending upon the degree to which exactitude in the change of frequency is carried. One part of the machine is motor, receiving the current to be changed, the other generating and delivering to the line the current produced or "manipulated." In recent work the vertical shaft type has been largely introduced in capacities of from 2,000 kilowatts upward. One machine designed for the Commonwealth Edison Company of Chicago, built while this report was in preparation, which changes from 25 to 60 cycles, is of not less than 6,666 kilovolt-ampere capacity, with 75 per cent load factor, and is probably the largest of its kind in existence.

While in a few cities the alternating current produced locally or received from a distance is used without any change to direct current, it would appear that in the consumption circuits and apparatus direct current is still preferred, in the standard voltages, from 110 up to 440. Because of this, the demand for "rotary converters," as they are called, is very large. These machines, of the synchronous type, have become the standard form of converting apparatus for low-frequency substations delivering low-pressure direct current to line. They receive the alternating current on one side and send out the direct on the other. Occasionally their place is taken by motor-generator sets in which there are two machines driving on the one horizontal shaft, the motor part of the device receiving the alternating current. This apparatus is, however, more in favor in Europe than in America. Probably the great majority of rotary converters enumerated in the present report are of the horizontal-shaft type, with collector rings at one side and the commutator on the other, but to meet the exigencies of limited floor space vertical shaft units have been manufactured, such as those of the 6-phase, 25-cycle, 250-volt, 2,500-kilowatt capacity designed for the New York Edison Company.

The extent to which apparatus of the auxiliary character described above may be needed, even for systems within city limits operating at pressures not to exceed 9,000 volts, can be inferred from the fact that at the end of 1907 the Commonwealth Edison Company of Chicago had a "peak-load" generating

output of 119,250 kilowatts in three stations. It sent its electrical energy to no fewer than 33 substations of the system within the corporate limits and to 11 substations belonging to various railway companies taking current for the operation of their cars. The rotary-converter rating connected to the 115-volt and 250-volt direct-current network in the central part of the city aggregated 50,700 kilowatts. The alternating-current motor-generator frequency-changer sets, through which 60-cycle energy was supplied to outlying districts, aggregated 21,340 kilowatts. To this must be added the similar auxiliary equipment of the railways, making the formidable total of 122,940 kilowatts. It might be added incidentally that the system also included, for discharging into its direct-current network in the heart of the city, storage-battery plants fed through the rotaries, etc., aggregating over 18,000 kilowatts in output at a one-hour rate of discharge.

*Transmission.*—It has already been intimated in the preceding discussion that the development of the central-station industry has depended materially upon advances in transmission methods and apparatus. While this is true, little that is revolutionary has been developed during the period. In fact, one of the leading authorities, Dr. Louis Bell, discussing the subject early in 1908, said: "Much of the power-transmission work of the last five years has been of an unobtrusive character, mere extension, without material change of what had gone before."<sup>1</sup> Nevertheless, a survey of the progress made discloses conditions that were a few years ago hardly deemed to be within the range of possibility, and such widespread extension of transmission systems as to constitute a new industry and a new well-defined branch of engineering to which experts give their whole attention.

While the voltage of generators furnishing current for either long or short distance transmission has remained around 2,000 to 2,500 volts, the pressure on lines has been boldly carried from 10,000 volts up to 100,000, and the latter figure seems to be by no means the limit, since far higher potentials are being discussed or are under experiment, with serious thought of their ultimate adoption. The raising and lowering transformers appear to be equal to all the strains thus far put upon them. It has been a common practice to equip such high-voltage transformers with taps on the high-voltage side, so that they may be worked at 5 or 10 per cent below their full voltage. In the earlier stages of the industry separate transformers were used for each phase of a 2 or 3 phase system, but now composite 3-phase transformers are a common type, and no difficulty has been experienced in providing them for pressures of 100,000 volts and upward.

The circuits are usually of bare copper, and possibly the high price to which copper was carried in the

"boom" period lasting up to 1907, about 25 cents per pound, may have had something to do with the effort to reduce the amount of copper in a line by raising the voltage. Aluminum has also been tried with success. The "pole lines" were originally of wood, as in the case of the first Niagara transmission to Buffalo, but steel poles and steel towers are now very general. The method of holding up the wires has varied. In California, with its dry climate, large pin-type porcelain insulators have been used with flaring "hoods" or "petticoats" to shed moisture, while another type is that of the suspension insulator. In the latter case several porcelain bells or drums, either plain or with concentric "petticoats," are strung together like reels on a thread, the uppermost insulator being carried by the cross-arm, and the lowest in the series supporting the transmission wire. The bells, of uniform size, ranging usually from 10 to 15 inches in diameter, are tied together by metallic links; and four or five of these bells in a bunch have a remarkable ability for standing up with very high voltage under all manner of adverse conditions of weather. The circuits are now more widely spaced, the separation averaging a foot per 10,000 volts; so that there is little risk of disturbance from anything except lightning. Many of the systems depend for lightning arresters upon "horn" or curved projecting ground wires of large dimensions; but others use multiple gap arresters, shunted to the ground from several points. A recent widely used type is an electrolytic lightning arrester which consists of aluminum cells, or jars, of large surface, stacked up in series.

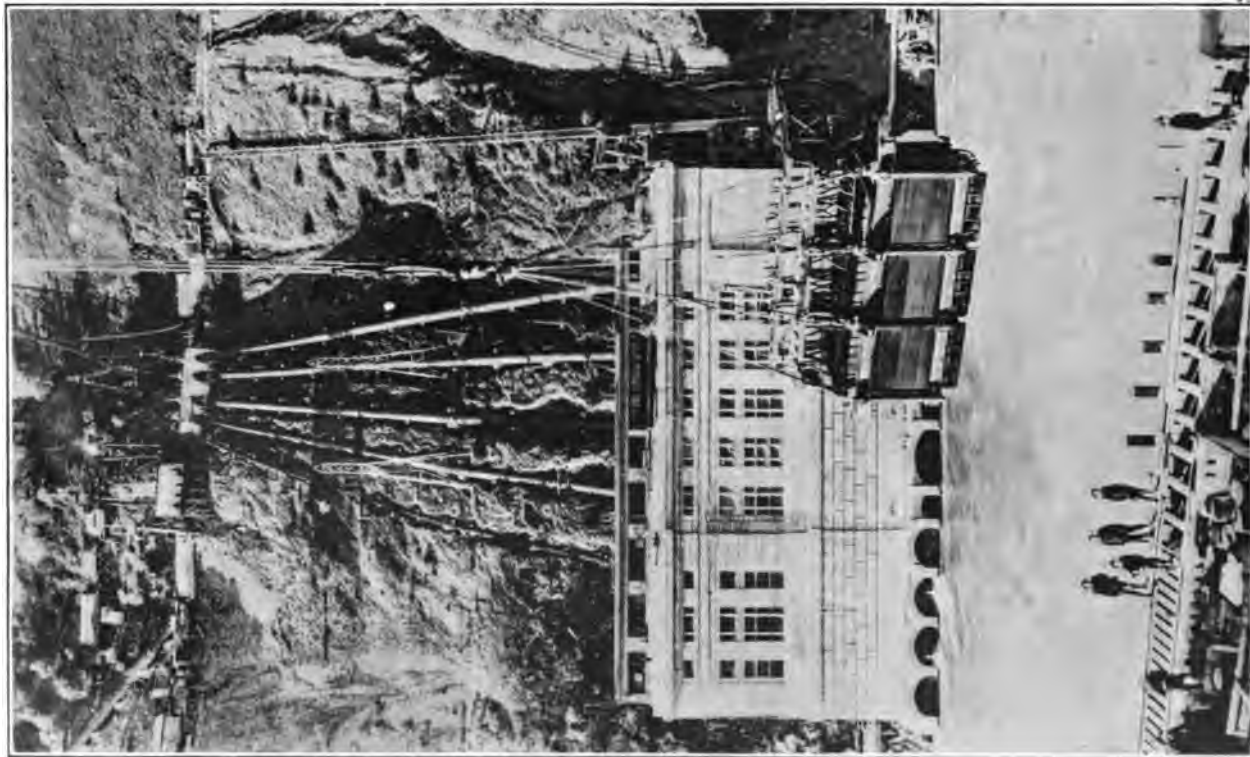
It has already been noted that the standard frequency of transmission of alternating current is 60 cycles. At Niagara Falls this frequency of transmission began with 25 cycles, and is still maintained. The vast heterogeneous network of the Los Angeles (Cal.) Edison Company operates at 50 cycles. In an address<sup>1</sup> before the National Electric Light Association in 1906, Mr. R. H. Ballard stated that the Los Angeles system then included 110 miles of transmission line with 33,000 volts pressure; 300 miles of double-circuit transmission with 10,000 and 15,000 volts pressure; and 750 miles of transmission line with 2,200 volts pressure in the various cities and towns served by the system; and that there were no fewer than 22 communities to which the company gave electric service with energy from all manner of sources, including a plant on the Kern River transmitting energy at 75,000 volts to Los Angeles, 120 miles away. The longest American transmission system, however, is that in northern California, where the circuits reach 232 miles, from De Sabla, in the Sierras, to San Saulito.

Another extremely long circuit is that from Niagara Falls to Syracuse, N. Y., a distance of 165 miles. The

<sup>1</sup> London Times, June 3, 1908.

<sup>1</sup> Proceedings, National Electric Light Association, 1906, Vol. I, p. 636 et seq.





CONVEYING A 10,000-KILOWATT, 100,000-VOLT TRANSFORMER WITHOUT CASE  
ACROSS THE FEATHER RIVER, CALIFORNIA.



METHOD OF MOUNTING DISTRIBUTION TRANSFORMERS ON POLES.

32



following description of this circuit is based on a paper<sup>1</sup> read by Mr. Ralph D. Mershon before the American Institute of Electrical Engineers in 1907. The system described is that of the Niagara, Lockport and Ontario Power Company, a purely transmission enterprise, buying its energy in bulk from the Ontario Power Company, which has a plant at the base of the Horse-shoe Falls on the Canadian side, where the dynamos generate 3-phase, 25-cycle current at 12,000 volts, which is transmitted to the transforming station, the circuits crossing the river in the gorge below the whirlpool. The potential is stepped up from 12,000 to 62,500 volts for the transmission lines which run on a private right of way from Lockport to Mortimer, a distance of 57 miles, and have a capacity of 20,000 horsepower. From Mortimer to Syracuse, a distance of 81 miles, the line on the company's private right of way has a capacity of 10,000 horsepower. From Lockport to a point 11 miles east and thence south on private right of way to the West Shore Railroad, and thence on the West Shore right of way to Pittsford, is another line with a capacity of 20,000 horsepower. From Pittsford to Syracuse on the West Shore right of way is a 10,000-horsepower line. From Lockport south to Buffalo are two transmission lines on private way, each with a capacity of 30,000 horsepower. Emphasis is laid on the provision made for isolating the circuits like railroad rights of way, and thus insuring safer and surer work.

Steel towers are used almost entirely, generally what is known as the "windmill type," "tripod" or "quad-ruped," and constructed of either lap-welded pipe, or structural steel, galvanized. The standard length of span between towers is 220 feet in some parts, 550 feet in others; while an extreme length of 1,253 feet is reached and an extreme height of towers of 75 feet. Each line of towers or wooden structures carries only one 3-phase system. The main line conductors are of aluminum, except on a portion of the line between Mortimer and Syracuse, where copper was preferred because of the long spans. Crossing the Montezuma marsh, the big steel towers have their feet deeply embedded in concrete foundations.

Three sizes of cable of "line wire" are used for the main transmitting line. The largest cable of aluminum consists of 19 strands, having a total of 642,800 circular mils, equivalent to 400,000 circular mils copper. The areas of cross section of the other cables are respectively two-thirds and one-third that of the large one. The insulator used on all main-line construction, designed by Mr. Mershon, has unusual factors of safety as regards flashing, etc., and consists of three shells of porcelain nesting into each other and cemented together with neat Portland cement, the whole insulator being cemented in a similar manner to a steel pin before attachment to the tower. The insulator is 19

inches in total height and the upper "petticoat" has a diameter of 14.5 inches. The lines are most liberally provided with fuses to cut out the circuits in case of trouble, and with disconnecting switches and lightning arresters. Speaking of the elaborate arrangements for protection against lightning, Mr. Mershon says:

Another feature out of the ordinary in connection with this station is the lightning-arrester equipment. This equipment is also out of doors and consists of a number of horn-type arresters mounted on wooden poles, in much the same manner as such arresters are ordinarily mounted. The installation differs, however, \* \* \* in that, instead of there being only one pair of horns for each conductor, there are three such pairs. One pair is set for a comparatively low-striking electro-motive force and has in series with it a high resistance; the next pair is set for a higher-striking electro-motive force and has in series with it a lower resistance. A third pair is set for very high-striking electro-motive force and has in series with it a fuse. The theory on which these arresters are installed is that for ordinary slight static disturbances in the line, the arrester having the lower-striking electro-motive force will discharge, and since it has in series with it a comparatively high resistance, the resultant disturbance to the system due to the generated current which follows the discharge will be comparatively slight.

The Grand Rapids-Muskegon plant and system may also be cited. They were installed in 1906-7, with 66,000 volt transmission in circuits totaling about 75 miles, supplying the Grand Rapids Edison system, various interurban and local trolley railways, and several large industrial plants. In the following year 35 miles of steel-tower line were added, and the potential has since been raised to 80,000 and 100,000 volts with success. These later circuits use the suspension type of porcelain insulator. Five of these insulators are hung, horizontally, one above the other, like beads. Each is 10 inches across, and the rated voltage it will withstand is 23,000 volts per "link."

*Distribution.*—The standard methods of distribution have remained the same throughout the country, with occasional interesting variations for some particular purpose. It may be noted that the new metallic filament lamps favor the 110-115-volt circuits to which Americans have steadily adhered through many years. In the United States the 220-volt, 3-wire system is the rule, but in Europe, and especially in Great Britain, the 450-volt, 3-wire system is equally the rule. One system employs 110-volt lamps on each side of the neutral, and the other requires 225-volt lamps. It is obvious that copper economics are with the 450-volt system, but on the other hand, the lamp efficiencies are with the 220-volt system. In Europe, moreover, the standard lamp is 8-candlepower instead of 16-candlepower, and it is the fact that here again the lamp efficiencies are with the 110-volt lamp of the higher candlepower. It would seem, therefore, that there is no immediate prospect of a change of American distributing circuits from 220 to 450 volts on the 3-wire distributing networks, but that, on the contrary, the new lamps will find a wider market than heretofore while confirming the practice at 110 volts.

<sup>1</sup>Transactions of the American Institute of Electrical Engineers, vol. 26, Part II, p. 1273 et seq.

An interesting innovation is that made by the Toledo (Ohio) Gas, Electric and Heating Company, in the adoption of a 4,600-volt system of alternating-current distribution. The transformers on the system are wound for 4,600 primary and 110-220-volt, 3-wire, secondary distribution. Current is generated 3-phase, but the distribution is single-phase. The generators are star-connected with the neutral grounded. The transformers are delta-connected. In the construction unusual care has been taken to avoid trees by running the lines high. Insulators and fuses are, of course, more expensive than for the usual standard of 2,300 volts.

Another interesting change was that made during the intercensal period by the Denver Gas and Electric Company from direct to alternating current in territory just outside the business district of Denver, Colo. The company had for motor service a 220 and 440 volt, 3-wire, direct-current power distribution, most of the energy being used in and near the downtown district. The lighting distribution of the whole city is by single-phase feeder lines supplied from 3-phase bus bars at the power station. The direct-current motor feeders were becoming so long and the number of distant customers so large that an excessive amount of copper was called for. The decision was made to change the motor service outside of the downtown district to 3-phase, and to give customers new 3-phase induction motors in place of their direct-current motors. Most of the direct-current motors were sold at good prices. The direct-current copper taken down was worth enough to reduce materially the cost of the change. A puzzling question was to decide whether to use 220 or 440 volt motors. With 220-volt motors but one customer could usually be supplied from a bank of transformers, whereas with 440-volt motors and secondaries several in one locality could be supplied. The latter advantage was considered to be more than counterbalanced by the fact that with 220-volt motors standard lighting transformers could be used. The change was made without interrupting any customer's service.

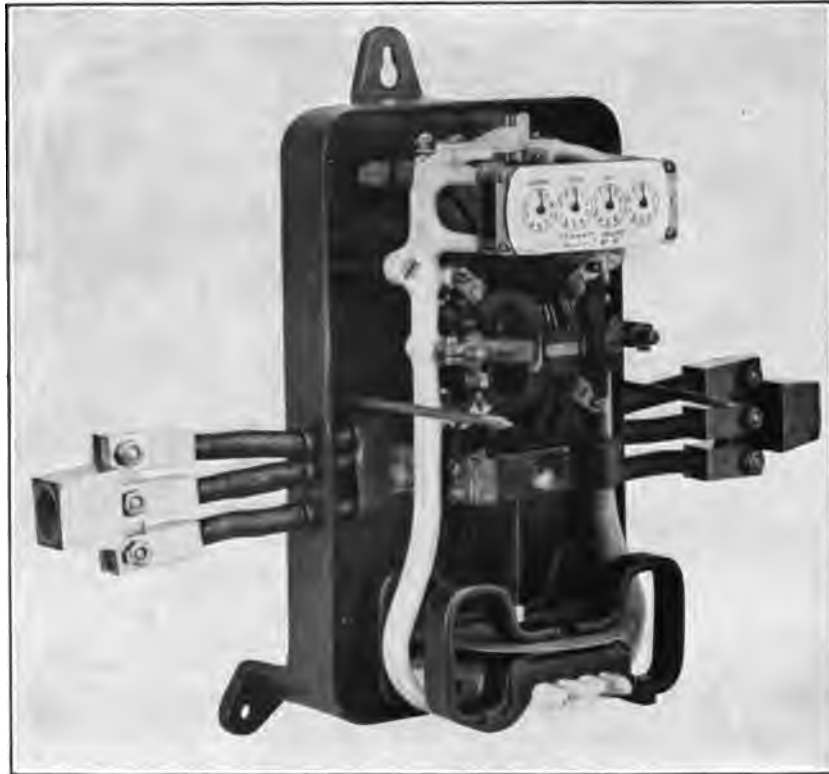
The central station company in Detroit, Mich., on establishing its new plant at Delray, 4 miles from the business center, installed machinery for the generation and transmission of electrical energy at 4,600 volts, 3-phase, 60 cycles, and developed an extensive power service to factories direct by means of such current. Incidentally it may be mentioned that one of the reasons for placing this plant at Delray on the salt beds was that by using the exhaust steam of the power plant to evaporate the brine from the wells a very economical and profitable day load was secured.

*Transformers.*—This class of apparatus, so necessary to power transmission by electricity, is also used largely in distribution circuits, and may therefore be properly considered at this point before taking up the "consumption devices," by which the electrical energy is used up in doing its work. Transformers

were fully described in the previous report and in the reports on the manufacture of electrical apparatus,<sup>1</sup> and therefore need not be considered here in great detail. The most important features in the recent development of transmission methods have been the introduction of a large number of the modern transformers employed to "raise" and "lower" the voltage, and the adoption of composite 3-phasers instead of a separate transformer for each phase. The size is determined, of course, by the general capacity of the plant and the amount of energy passing out or in over the respective circuits. The Ontario Power Company, on the Canadian side of Niagara Falls, which delivers current for use over a large part of New York state south of Lake Ontario, employs transformers each of which has a capacity of 3,000 kilovolt amperes, and weighs, when filled with its insulating oil, approximately 50 tons. The current is received from the generators at 12,000 volts, and after being raised to 36,000 volts in the secondary winding, a line voltage of approximately 62,000 volts is secured by connecting the transformers two in series. At the Great Falls (South Carolina) power plant of the Southern Power Company the transformers are rated as of 2,000-kilowatt capacity. They are oil-insulated and water-cooled, and take 2,300-volt current from the generators, raising it to 44,000 volts for the line. By means of multiple connections inside or outside the transformer tank, 1,900, 2,000, 2,100, 10,000, and 22,000 volts can also be obtained. Oil for the transformers is furnished either by gravity or under pressure. Circulating water, for transformer-cooling purposes, is obtained by gravity. With a rise in temperature not exceeding 60° C., a circulation of 4 gallons of water per minute at full load is required; while with 5 gallons per minute and 1.25 load, the temperature will not exceed, by 55° C., that of the intake water during continuous operation. All the transformers are connected to a piping system by which carbonic acid gas can be admitted in case of fire.

As shown in Table 40 of Chapter III, main-station transformers were not enumerated in 1902, but in 1907 their number was reported as 1,577, with 592,708-kilowatt capacity, which is in itself a fair indication of the amount of "transmission" work done in the country. As was remarked in that chapter, there was little uniformity among the companies in the manner of reporting their miscellaneous equipment of this character. While the main-station transformers, therefore, are probably reported with fair accuracy, considerable doubt attaches to the statistics for what may be called the substation equipment, because here the border line to distributing apparatus in some instances is crossed. In Table 41 substation transformers to the number of 4,211 were reported for 1907, with 1,100,824-kilowatt capacity, while in

<sup>1</sup> Census Bulletin 245, Electrical Apparatus and Supplies, 1902, p. 10; Bulletin 73, 1905, p. 25.



400-AMPERE, 116 TO 120 VOLT METER UNCASD TO SHOW MECHANISM.



HIGH-VOLTAGE TRANSFORMER, SOUTHERN POWER COMPANY.



MODERN TYPE OF DISTRIBUTION TRANSFORMER.

Mr. U

1902 only 1,800, of 312,848-kilowatt capacity, were reported. It will be observed that the substation or receiving transformers are just about double the total capacity of the main-station transformers.

Three of the largest transformers in existence were manufactured during the year 1908-9 for the Great Western Power Company of California. The main power house of this company is located on the Feather River, near Oroville, in the county of Butte. The ultimate head of water developed is 525 feet, and 40,000 horsepower is transmitted at 100,000 volts to points along the coast 165 miles distant. The total weight of each of these monster transformers is 128,000 pounds, of which 40,000 pounds is due to the 5,000 gallons of oil used in each machine for cooling and insulating purposes. Each transformer is shaped like a giant wash boiler, stands 20 feet above the floor, and measures 9 by 18 feet. When these machines are working they each transform 10,444 kilowatts of electrical energy from a low voltage to a high voltage at the remarkably high efficiency of 98.6 per cent. The transformers for the Great Western Power Company are slightly larger than the six recently installed for the Great Northern Company of Duluth, Minn., which are in successful operation.

In Table 53 of Chapter IV the number of "distributing" transformers, or those on customers' circuits in 1907, is given as 299,489, with a total of 2,058,567-kilowatt capacity. There was a marked tendency toward an increase in size. The average capacity of these transformers more than doubled during the five years ending 1907, namely, from a little over 3 kilowatts to nearly 7. There has also been a great improvement in the construction of such transformers during the past five years. On this subject Mr. W. K. Layman<sup>1</sup> says:

Much of this improvement has been the result of a continuous and, recently, quite sharp improvement in the magnetic quality of sheet steel. The latest quality of transformer steel has been exploited under the various names of silicon steel, alloy steel, silico vanadium, and the like, with claims of individuality for each. The substantial fact is that these names are synonymous. They all refer to a quality of material in which the percentage of silicon has been greatly increased over that previously prevailing over the art. In chemical composition, the best material, as commonly employed in use to-day, shows the following analysis:

|                      | New steel. | Old steel. |
|----------------------|------------|------------|
| Combined carbon..... | 0.070      | 0.080      |
| Manganese.....       | 0.170      | 0.240      |
| Sulphur.....         | 0.023      | 0.050      |
| Silicon.....         | 3.700      | 0.094      |
| Aluminum.....        | 1.314      | 0.050      |

It has been known from a very early date in the history of commercial transformers that silicon improves the quality of steel for transformer purposes, and some of the early technical writers explained the nonaging quality of impure steels, as compared with the

pure, on the score of the presence of appreciable quantities of silicon. Manufacturing difficulties are said to have held back a quality of steel with as much as 3 per cent of silicon until about two years ago, when European mills began producing successfully this high silicon material, and very quickly its manufacture began here.

This change in chemical composition, together with special heat treatment by the manufacturer, has resulted in a marked improvement in the magnetic quality of the steel. The saving in internal energy losses with this material, as compared with the old, averages about 25 per cent. With this new material, if the weight is left the same, the performance will be greatly improved. If the performance remains unchanged, the weight is greatly reduced. Manufacturers have in general compromised between the two extremes and have built transformers lessened somewhat in weight but substantially improved in performance. Distributing transformers of modern type are usually for pole lines or for manholes, and differ in their adaptation to such specific use. If for pole-line service, the transformer is made as weatherproof as possible. If for manhole use, it is made water-tight or air-tight. As to the usual requirements, Mr. E. G. Reed said in a paper<sup>1</sup> read before the National Electric Light Association:

Standard transformers are made for only two voltages on the primary side—and in case of particular requirements a special transformer should be secured. For this reason modern commercial transformers are made for only two voltages on the primary side—that is, nominally 1,100 and 2,200 volts—and two voltages on the secondary—that is, nominally 110 and 220 volts. Standard transformers must be designed to operate at 1,100 volts, as well as at 2,200 volts, since there are still a number of stations using this voltage, though their number is decreasing. There is a limited demand for transformers with multiple-ratio taps on the primary winding, and sometimes for units having three secondary voltages. Such transformers can be secured for prices slightly higher than for the standard line. The demand for transformers having three secondary voltages arises from the convenience which at times results from having units which are interchangeable for light and power service. Lights are operated at nominally 110-220 volts, and motors at nominally 220-440 volts. The performance of the transformers with three secondary voltages is slightly inferior to that of the standard lines, which will probably more than offset the interchangeable feature. The increased complexity of the transformer provided with the numerous voltage combinations renders more likely a wrong connection when installing and the more chance of losing transformer by burn-out.

*Storage batteries.*—This class of apparatus has been found a necessary adjunct in most central stations or their substations in large cities, and is also found associated with many of the power-transmission systems. Persons familiar with the operation of storage batteries will appreciate the difficulties to be encountered in securing data as to number or capacity. While some figures are given in Table 40, Chapter III, as to number, which may be accepted as reasonably accurate, indicating a considerable increase in the number of cells, no effort has been made to report the

<sup>1</sup> Practical Aspects of Recent Improvements in Transformers, in Proceedings, National Electric Light Association, Vol. II, p. 220 et seq., 1909.

<sup>1</sup> Proceedings, National Electric Light Association, 1909, Vol. I, p. 581.

capacity, owing to the different methods in vogue of rating them or of employing their capacity.

At an earlier period batteries were used to even up the load on the generators in large central stations, but they are now used principally for emergency or "stand-by" service in substations and for carrying peaks of short duration. Their plates have therefore been designed to give the maximum output of energy for short and infrequent periods with a minimum first cost, upkeep, and space requirements. As a result the plates of later type will give nearly twice the output of the old plate, for twice the time, with a higher terminal voltage. Another development in such emergency service has been in connection with the auxiliary apparatus. End-cell switches that travel at high speed over the bars and are capable of carrying current up to 20,000 amperes for short periods have been successfully introduced. These switches can cut in or cut out from one to three cells per contact point, while carrying the maximum current, involving a great reduction in the cost of the copper conductor bars, since the number of runs from the end cells is reduced.

The use of batteries has enabled central stations to secure and execute large contracts for power that might otherwise have escaped them and fallen to isolated plants. In this connection Mr. Joseph Appleton, in a paper<sup>1</sup> read before the National Electric Light Association, says:

Equally important to the development of the emergency or stand-by battery comes the improved regulating features of storage batteries in connection with fluctuating direct and alternating-current power loads. The electrification of steam roads, and the increasing use of electrical energy in manufacturing plants, where large motors on fluctuating service are used, has necessitated the development of apparatus that will give a flexible control to the battery equipment and make it take that portion of the load, and that portion only, which gives the most efficient results as a whole to the substation or the power plant. Methods have been perfected which practically enable a selective control to be obtained, making the battery take any portion of the fluctuation desired for any predetermined time. For example, a battery equipment can be adjusted by this method to take the top part of the fluctuations only, not beginning to discharge until a predetermined portion of the fluctuation has been thrown on the generator or substation. It can be made to take the lower portion of the fluctuation, stopping at any desired point; or, further still, it can be made to take the first swing of the fluctuation, and then gradually throw the additional load caused by the fluctuation, up to any desired point, on to the generator or substation. With this apparatus any combination can be made to suit the capacity of the generating or rotary capacity with their overloads, so as to give the best net result to the system. This development of battery regulation is especially suited for such loads as are found in steel mills, the hardest kind of service for electrical apparatus which I believe exists.

It should be noted here that the storage battery is constantly adding to the consumption of electrical energy through its use in vehicles of all kinds. Such batteries, charged directly from the circuits or through the intervention of mercury arc rectifiers and motor-

generator sets, are numbered by thousands, and the income to the stations from this source is already large.

*Arc lamps.*—A very full account of the development of modern arc lamps up to 1907 will be found in the last census report on the manufacture of electrical apparatus, Bulletin 73. But the subsequent development has been very rapid and new types continue to be evolved. The nature of some of these changes has been quite fully discussed in Chapter IV, and the figures given there indicate the extent to which the old form of open arc was superseded by the inclosed type during the period 1902–1907. The evolution now going on is in the nature of a partial reversion to the open arc, and the abandonment of the inclosed, for outdoor service, while an intensified rivalry with new metallic filament incandescent lamps promises further advances in the direction of economy and efficiency.

The resort to "flaming arcs" has been one of the most noteworthy and spectacular of the changes which the mere figures do not bring out, such lamps being adopted not merely for advertising purposes but for ordinary street illumination. Newark, N. J., affords an example that is strictly new and up-to-date in the special illumination of South Broad street with flaming arcs. This thoroughfare is no less than 100 feet wide, and the merchants on it were keen to secure more patronage. They formed an improvement association and have carried out an agreement with the Public Service Corporation, under which the city makes an allowance to the merchants equal to the sum paid to the company for the former inclosed arcs on the street. A system was laid out of permanent flaming arcs and of special supplementary incandescent lighting for the first two weeks. The arcs, of which there are 35, replacing 21 alternating-current inclosed arcs, are rated at 10,000 candlepower each, and are erected on poles along three blocks of the street, at a spacing of 60 feet. The new installation has been put in on a three-year basis of contract under which the lamps burn from dusk to dawn. The plan was such a brilliant success in all respects that steps were immediately taken to add two more blocks with an additional 15 arcs.

Flaming arc lamps are now being specified by engineers for municipalities and industrial-plant lighting, and naturally the question of maintenance cost is of prime importance. Two distinct types are now on the market, namely, the differential lamp and the so-called "gravity-feed" lamp. The differential lamp is generally adjusted to operate two lamps in series on 110-volt circuits, taking 10 amperes for the series, whereas the gravity-feed lamp, as a rule, is adjusted at 11 or 12 amperes. The differential lamp being taken as an example, the consumption of each lamp is 550 watts, which at an average cost of 2 cents per kilowatt-hour makes the cost \$11 per 1,000 hours for current. The net cost of flaming arc-lamp carbons being taken as an example, the cost per trim per 1,000 hours, including labor, would be \$8.50, making the total cost of trim

<sup>1</sup> Proceedings, National Electric Light Association, 1909, Vol. I, p. 195.



TUNGSTEN LIGHTING, RIVERSIDE DRIVE, NEW YORK CITY.



INCLOSED ARC-LIGHT LAMP-POSTS, FIFTH AVENUE, NEW YORK CITY.

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and carbons \$19.50 per 1,000 hours. The cost of repairs and globes per 1,000 hours may be figured at \$2, to which \$2 per 1,000 hours must be added for interest on the investment and depreciation, making a total of \$23.50 per 1,000 hours of operation. At an average yearly operation of about 4,000 hours the cost would be \$94 per year per lamp.

For municipal lighting the general plan of installing these lamps is to mount two lamps on one pole, as it simplifies the wiring problem over the plan of mounting one to a pole. The height of the lamps above the sidewalk should not be less than 25 feet, so as to secure a good distribution for their high candlepower.

At the annual convention in August, 1908, of the Ohio Electric Light Association, Mr. C. R. McKay, of the Toledo Railways and Light Company, read a paper in which he described an installation of 1,670 luminous magnetite arc lamps in regular service for street lighting at Toledo, Ohio. All the street lighting in Toledo is now done by means of such lamps, which for the most part are spaced approximately 600 feet apart in the residence and outlying districts of the city. In some other parts of the city, such as the principal shopping district, two lamps are placed on each pole and the poles are spaced 80 feet apart opposite to each other on each side of the street. The energy is generated by 25-cycle, 3-phase turbo-generators. To supply the arc lights, 37 constant-current transformers wound for 2,200 volts primary are installed, together with a corresponding number of mercury arc rectifiers and switch-board panels.

The lamps are generally hung over the center of the street intersections, at a height of approximately 25 feet, by means of suspension wires, and are lowered for trimming. The light in this type of lamp issues chiefly from the long arc itself rather than from the positive crater. It is therefore quite sensitive to rupture by drafts of air unless thoroughly protected by wind-proof casing and tight globes. Early difficulties with the upper electrode have been remedied by using copper of large diameter. The life of the lower electrode has been increased from 110 to over 160 hours. The lamps average from 320 to 324 watts per lamp, including line losses, as measured at the direct-current circuit terminal. The current is about 4 amperes. They take 38 per cent less energy per lamp than the 7.5-ampere alternating-current lamps they displaced. The residents of East Toledo gave unmistakable testimony to the superiority of the luminous arc over the 7.5-ampere inclosed-carbon arc, by objecting publicly to the use of the latter during a temporary interruption of the other circuit. The 1,670 lamps, distributed over 37 circuits, are trimmed by three trimmers, each provided with a horse and buggy. About 1 per cent of the lamps are usually in the shop for adjustment or repairs.

An interesting and novel feature of arc work is the "regenerative" inclosed flame, intended for streets and open spaces. If an ordinary flame arc were in-

closed, the heavy fumes evolved from the impregnated carbons would soon form a deposit on the globe and obscure the arc. In this new lamp special means are provided for obtaining a circulation of the gases past the arc, and the light is produced mainly by raising such gases to the temperature of incandescence, and not merely by the combustion of chemicals in the arc. The spectrum of the light is a band-and-band line spectrum, which shows that the gases are in various stages of incandescence. About 15 grams of the associated composition are volatilized every hour, the gases rising from the positive crater through the arc. The lower carbon, which is the positive, is held in a fixed support. Surrounding the arc is a clear-glass cylinder, and outside this again is a translucent globe. The inner glass cylinder is in communication with two metal tubes, one on each side of the globe. There is a circulation of the hot gases up the central cylinder and down the other tubes, and the incandescent gases are carried around and subjected to the high temperature of the arc several times before finally condensing and settling in the outer tubes. The inner glass cylinder is kept perfectly clear of deposit for the greater part of its length, chiefly by the high temperature which prevents the gases condensing, but also probably by the strong direct draft past the arc. The upper negative carbon is an ordinary high-grade carbon. The lower stick is also of high-grade carbon, but is star-shaped in section. The grooves between the eight rays of the star are filled with the chemical composition, which is laid in in the form of a paste. The rods are then baked, and the paste expands into the pores of the carbon and fixes itself firmly into the grooves. The life of a single pair of carbons is over seventy hours. The light is of a yellow-white color, but modifications can be obtained by varying the nature of the composition on the positive carbon. The 550-watt size, taking 5.5 amperes at 100 volts, gives a mean hemispherical candlepower of 2,200.

Among the arc lamps in actual service on central-station circuits may be mentioned those with carbons of smaller diameter than usual, the object being to obtain a whiter and more efficient light, as well as its better distribution. Such lamps have a special adaptation to interior use, where they compete directly with incandescent and "glower" lamps. A typical lamp of this character has a lower negative carbon of large diameter, and a pair of upper positive carbons of small diameter, inclined at an angle to each other. The lower carbon is held in a fixed position while the two small upper carbons are arranged to "draw the arc" on starting, and feed downward as they are consumed. The arc is thus centered in one permanent position, making possible the use of a reflector to project the light entirely into the lower hemispherical plane of illumination. The arc is also inclosed by a large globe which restricts the access of air and brings about conditions similar to those which insure the long life of the carbons in an inclosed arc lamp.

Modifications in fixtures, globes, transformers, etc., to meet the changing conditions have necessarily been made, but as a general thing the manufacture of dynamos specifically for arc lighting, as in the early days, has ceased. The lamps now derive their supply of current from generators which operate a variety of other devices at the same time.

*Incandescent lamps.*—Data are given in Table 45 of Chapter IV as to the approximate number of incandescent lamps on the circuits of central-station plants, namely, 41,445,997 in 1907, or an increase over 1902 of 127.8 per cent. A large gain was shown also in the connections to electric-railway circuits, making a total of approximately 45,991,836 lamps connected. The grand total in the country could be given, however, only after ascertaining the data of isolated plants in office buildings, factories, steamships, and other similar private establishments, and such figures it is impracticable to obtain. Some authorities have assumed the connected lamps of such plants to equal in number those of the central stations, which seems rather improbable; but even if they do not, the total of consumption, assuming each lamp to be renewed once a year, is enormous.

A discussion of many features in the development of the incandescent lamp during the period will also be found in Chapter IV. Attention is there drawn to the nature of the data relating to lamps of 32-candlepower and 16-candlepower, the latter being the standard size. The introduction of metallic-filament lamps and other types has changed the importance and universality of such units, but the heterogeneity prevalent at the time of this report will doubtless settle down again to a limited number of standards by 1912, the probable year of the next electrical census. The varieties of one kind and another now run literally into the thousands, adding seriously to the cost of manufacture and carrying in stock, and it may be questioned whether the consumer is benefited in the end, by an illimitable freedom of choice, which often affects the construction of fixtures and the conditions of the supply circuits. What is involved in the transition may be inferred from the following comment:<sup>1</sup>

So many conditions are involved in a change from one set of fundamental apparatus to another, the period of transition must necessarily be long even if the expected improvements make good. The era of electric traction is well begun, but the steam locomotive, and even the horse car, still prevail. As a matter of fact, it is more interesting and practical to watch the actual incipient changes than to speculate on the possible scope of a whole revolution. For instance, there is an indication that a change in the art is upon us in the scarcity of old-style standard 32 and 50 candlepower lamps, due to the fact that makers are getting ready to discontinue their manufacture. The lamp manufacturers announced their intention some time ago of discontinuing the manufacture of the old common carbon-filament lamps in sizes of over 100 watts because of the advent of the new graphitized-filament lamp now commonly known as the "Gem,"

which latter, because of its higher efficiency, would be certain to supplant the old standard lamps even if the manufacture of the old lamps was not discontinued. But here comes in one of the prosaic points of detail. The position of the man who has an installation of standard 32-candlepower lamps with standard shade holders and who must substitute the new lamp, which is considerably larger in bulb and longer in neck than the old standard 32-candlepower lamp, is not a profitable one. The new lamp, as made, requires special shade holders when fitted with reflectors. The old standard shade holders leave the shade "high and dry" above the lamp bulb, defeating most of the purposes for which the shade may be intended. If the change to larger bulb lamps requiring different shade holders causes the owner at the same time to change to glassware that is suited to the purpose of most efficient illumination, the change in lamp sizes will have been a good thing aside from all questions of lamp efficiency.

The departure from the familiar form of carbon-filament lamp and the present popularity of the metallic-filament lamp are well described in a recent article by Prof. Albert F. Ganz.<sup>1</sup> It is pointed out that the early carbon-filament lamps required 5 to 6 watts per candle, but improvements in the manufacture of the filaments had, by about 1888, decreased this specific power consumption to 3.1 watts per candle. The high efficiency lamps, having a specific consumption of 3.1 watts per candle, could, however, be used only on circuits having close-voltage regulation, as otherwise the life of the lamp was greatly reduced. No radical improvements in carbon-filament lamps were made for over fifteen years, until about 1905, when the metallizing or graphitizing process for treating carbon filaments was developed. This process consists essentially in subjecting the carbon filament to the high temperature of an electric furnace with the result that the filament is partly or wholly graphitized. The filament is then "flashed" and subjected to the electric furnace for a second time. The graphitized or metallized carbon-filament lamp, known also under the trade name of "Gem" lamp, has a specific power consumption of 2.5 watts per candle, with the same normal life as the ordinary carbon-filament lamp. A further remarkable alteration produced in the carbon filament by the metallizing or graphitizing process is the change of the temperature coefficient of resistance from negative to positive, so that the treated filament behaves in this respect like a metal. This positive temperature coefficient makes the lamp much less influenced by fluctuations in the supply voltage.

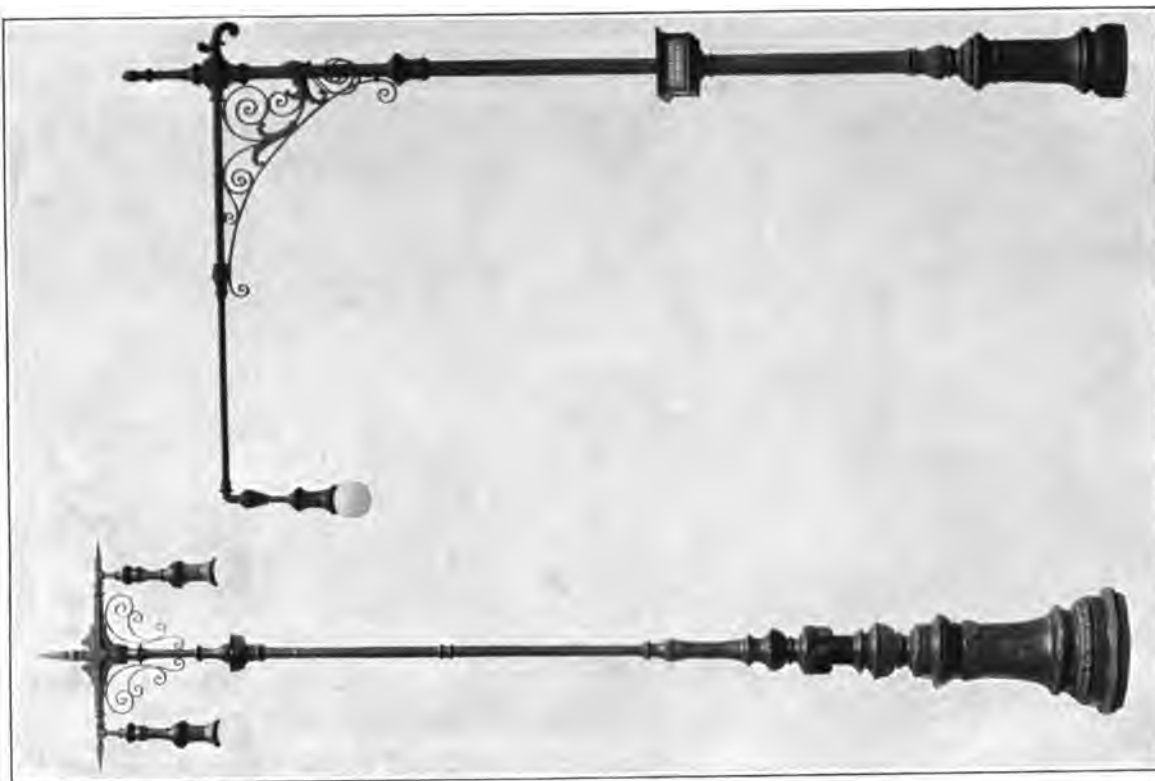
Meantime, incandescent lamps containing filaments of metal and giving efficiencies much higher than could be obtained with carbon have been introduced. Platinum was tried in the early stages of the manufacture, but was found not entirely satisfactory. Osmium was the first metal tried in the newer work, and a fairly satisfactory lamp, having a specific power consumption of 1.5 watts per candle, was obtained. A number of osmium lamps have, in fact, been used commercially in Germany, but the very limited available supply of

<sup>1</sup> Report of Committee on Progress, National Electric Light Association, 1907.

<sup>1</sup> American Gas Light Journal, July, 1909.



ARC LIGHTING ON SEVENTH AVENUE, NEW YORK CITY.



TYPES OF MODERN ARC-LIGHT POLES.

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this metal has prevented the commercial introduction of this type on a large scale.

About the year 1904 lamps employing tantalum filaments were placed on the market, having an efficiency of about 2 watts per candle, with a useful life greater than that of the carbon-filament lamp on direct-current circuits. Processes were developed for producing pure ductile tantalum which was then drawn into fine wires for use in the lamps, and these tantalum lamps have come into considerable commercial use. A peculiarity of the tantalum lamp is that it has a short life when used on alternating current. The lamp is therefore inherently a direct-current lamp.

The following year incandescent lamps having filaments of tungsten were made in Germany. They had a specific consumption of about 1.25 watts per candle with a useful life claimed to be greater than that of the carbon-filament lamp, and worked equally well on both alternating and direct current. These lamps were quickly introduced on a large scale. The manufacture of tungsten lamps was also started in America about 1907, and they are now rapidly coming into use. Since tungsten is not ductile, the tungsten filaments can not be drawn into fine wires as in the case of tantalum. The production of a filament of tungsten, therefore, presents many difficulties, with the result that several different processes for producing these filaments have been developed. Since the specific resistance of tungsten is very much less than that of carbon, a filament of tungsten for a lamp to be operated at a given voltage must be very much thinner and longer than a carbon filament for the same voltage. For this reason tungsten filaments are admirably suited for heavy-current, low-voltage series lamps for use on constant-current circuits for street lighting. Multiple lamps for 110-volt constant potential circuits are now also manufactured in sizes down to 20-candle-power, but the filaments in these lamps are extremely small in diameter. When the tungsten filament is incandescent it is extremely soft, and the loops, especially those for high-voltage lamps, require supports to keep them in position. The first tungsten lamps were for this reason capable of operating only in a vertical downward position. The lamps have been so improved that they can now operate in any position. The high-voltage tungsten filament is, however, extremely fragile, and liable to break when subjected to vibration, so that these lamps are not yet suitable for places subjected to vibration, as, for instance, on trains or boats. In these latter places, however, the tantalum lamp and the low-voltage tungsten lamp are frequently used.

Both the tantalum and tungsten filaments have a positive temperature coefficient, and for this reason are less affected by fluctuations in line voltage than ordinary carbon filaments. The light given by tantalum and tungsten lamps is also much whiter than that

given by carbon-filament lamps, owing to the higher temperature at which these filaments are operated. Another peculiarity of these metal-filament lamps is that they do not depreciate from their initial candle-power until the filament finally breaks. It is at times even possible to repair a ruptured tantalum or tungsten lamp filament by judiciously shaking the lamp with the current on, until the broken ends of the filament come in contact and are welded together by the intense local heat at the point of contact. Such a weld is frequently quite strong, enabling the lamp to continue in service for a considerable time.

The report of the lamp committee of the National Electric Light Association for 1909 brings out some interesting data as to conditions in regard to incandescent lamps in general during the period under review in the present report, based upon data from 200 of the largest central-station companies in the country. It is remarked that as to the general use of different types of lamps, the carbon-filament lamp was still the standard lamp, although the metallized-filament lamps were being used extensively by the companies, more than 60 per cent of those reporting having already used a considerable proportion of such lamps. Several of the larger companies proposed to abandon the standard carbon lamp entirely and furnish the metallized or Gem filament lamps for all their free renewals.

Tungsten lamps had also been in general use, about 75 per cent of the companies reporting that they had used such lamps, and of these in turn fully 75 per cent made extensive use of them and encouraged their introduction generally in their territories. The reports indicate considerable difficulties with the early lamps of this type, but a decided improvement in the later installations. The opinion is almost unanimous that the tungsten lamp is the best possible instrument for making satisfied customers and producing additional revenue. In the matter of incandescent street lighting, a small proportion of the companies reported changes to tungsten lamps, with apparently satisfactory results in all cases.

The number of companies using tantalum lamps was much smaller, about 20 per cent only, and the use of tantalum lamps was apparently becoming more restricted rather than extended. Free lamp renewals was the general practice, except in the case of very small companies and a few of the larger companies. Most of the companies that had furnished carbon lamps on a free-renewal basis were extending that policy to the metallized-filament lamps.

In the matter of delivering lamp renewals, about half of the companies required the customers to send for all lamps; about 10 per cent delivered all renewal lamps upon request of customers; and about 4 per cent made deliveries in accordance with a definite schedule for covering the territory systematically. The other companies encouraged customers to send

for lamps, but also delivered upon request, subject to restrictions.

About 25 per cent of the companies making deliveries also placed the lamps in the sockets when requested. About 15 per cent of the companies had their free-renewal lamps marked for identification.

Most companies recognized the difficulty of preventing waste or loss of lamps without placing annoying restrictions upon the furnishing of lamps to customers, and about half the companies reporting kept a record of deliveries to individual customers and attempted, by means of such records, to avoid undue losses.

In the matter of renewing blackened and broken lamps, the general policy seemed to be to refuse to renew broken lamps, but to renew blackened lamps. In the matter of reserve stock, most of the companies carried a safe reserve, which in all the companies reporting would average about two months' supply. The prices charged for other than standard free-renewal lamps varied with the different companies from list prices to cost prices, with, on the whole, little uniformity between the companies.

At the January, 1908, meeting of the Pittsburg Section of the American Institute of Electrical Engineers the physical properties of the various forms of lamps then in use were summed up in the following table presented by Mr. A. J. Sweet:

| KIND OF LAMP.                                                                                                   | Mean<br>spher-<br>ical<br>candle-<br>power. | Watts<br>per<br>candle. | Candle<br>per<br>K. W. |
|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------|------------------------|
| Common 56-watt carbon-filament incandescent lamp, rated at 3.5 watts per candle, 16 horizontal candlepower..... | 13.2                                        | 4.24                    | 236                    |
| Common 50-watt carbon-filament incandescent lamp, rated at 3.1 watts per candle, 16 horizontal candlepower..... | 13.2                                        | 3.78                    | 264                    |
| 3-glow, 264-watt Nernst lamp.....                                                                               | 81.0                                        | 3.26                    | 307                    |
| Gem, 125-watt, graphitized carbon-filament lamp of 50 horizontal candlepower.....                               | 40.7                                        | 3.07                    | 326                    |
| 44-watt tantalum lamp, rated at 22 horizontal candlepower.....                                                  | 16.0                                        | 2.75                    | 364                    |
| Direct-current, 5.1-ampere inclosed arc on 110-volt circuit, 1.5-inch carbons.....                              | 213.0                                       | 2.63                    | 380                    |
| Alternating-current inclosed 5.7-ampere arc, taking 388 watts on 110-volt circuit, 0.5-inch carbons.....        | 152.0                                       | 2.55                    | 392                    |
| 60-watt, 110-volt tungsten-filament lamp, burning at 1.25 watts per horizontal candle.....                      | 37.0                                        | 1.62                    | 617                    |
| Luminous 8-ampere arc, 440-watt, two in series on 110-volt circuit.....                                         | 1,020.0                                     | 0.431                   | 2,320                  |

At the March, 1908, meeting of the New England Association of Electric Lighting Engineers, Mr. J. S. Whitaker, of the Rockingham County Light and Power Company, Portsmouth, N. H., read a paper on the introduction of the tungsten lamp. Citing a life test made upon an 80-candlepower, 115-volt lamp, he stated that it burned eight hundred and sixty-four hours continuously, with no perceptible change in color or diminution of light, though no photometer test was made. He instanced a small dry-goods store, which had originally an installation of incandescent lamps and gas arcs combined. Tungsten lamps were installed in the show windows and one wing, on free trial, with the result that an order was placed for a complete

tungsten installation. The lighting cost to the merchant for December, 1907, was 20 per cent less than a year before. During seven months Mr. Whitaker purchased 850 tungsten lamps; of these 27 were broken in transit, 418 were installed, and 143 burned out. It was found that 75 per cent of the early "burn-outs" occurred in the first one hundred hours. Later lamps were better and more uniform. A charge of \$1.75 each for 100-watt lamps was made to the consumer. This allowed for transportation and breakage. The company replaced all lamps not burning one hundred hours.

In the discussion Mr. Willcox, of Lowell, stated that a rental basis of 25 cents per month had been found satisfactory in meeting the gas-arc competition. Mr. Sands, of Haverhill, stated that he loaned the shades and reflectors in store installations of tungsten lamps; and if one was broken or lost, the customer paid for it. Mr. Cowles, of the Boston Edison Company, said that his company had installed about 1,200 80-candlepower tungsten lamps, charging an excess of \$1.10, the lamp remaining the property of the company. The life appeared to be very good—thus far, at least seven hundred hours. The company placed the lamps in the sockets itself, pendant sockets being used. Mr. Hale, of the Boston company, said that most customers appeared to prefer the lamp installed with a clear shade, even though the company advised the use of a sand-blasted globe and etched shade. In Peabody, Mass., in order to meet gas-arc competition, 100-watt lamps were installed at a charge of \$1.50 each, with a guarantee that the annual cost of renewals should not exceed \$3 per lamp, which was the yearly rental charged by the gas company. In a bowling alley where formerly there was one gas lamp between each pair of alleys the tungsten lamps were placed, one over each alley, with reflectors adjusted to keep the light out of the eyes of the patrons, and to direct it onto the pins.

It may be added that since the date of the meeting last mentioned, all the points in favor of the tungsten lamp have been improved upon, including longer life, lower price, and less breakage in transit.

The number of cases of adoption of incandescent lamps for street lighting in the period has been remarkable, and the more noteworthy because a great deal of the new work is due to the efforts of merchants doing business along the streets illuminated rather than of the municipal authorities. In other words, it is another example of the stronger public spirit manifested in late years; and it may also be regarded as an evidence of the local pride which seeks to build up the community and its trade. Numerous concerted efforts have been made to enhance by such action the brilliancy and attractiveness of sections of particular thoroughfares or even of whole streets. This development is, moreover, particularly interesting as being in itself an evidence that the general lighting at such points is inadequate. Causing, as it does, too, an



TYPE OF ORDINARY TUNGSTEN LAMP.



1,000-CANDLEPOWER TUNGSTEN LAMP COMPARED WITH  
ORDINARY 16-CANDLEPOWER CARBON LAMP.



INCLOSED ARC LAMP WITH ORNAMENTAL CASING FOR  
INDOOR SERVICE.



TYPE OF FLAMING-ARC LAMP.

U of M

Ms. 100



accentuation of the surrounding gloom, it bids fair to be a factor in raising the general scale of street illumination.

A plan of extra lighting that has now become quite common is seen in arch lighting, of which there are many varieties. For example, Canal street, Grand Rapids, Mich., has been specially illuminated with series tungsten lamps, in 15 spans across the thoroughfare, each with 18 lamps of 60-candlepower, 75 watts. The spans are 100 feet apart, 110 feet in length, and the initial expense was \$750 each for labor and material. Merchants paid for the work, and the cost of operation is so small that some of them are at an expense of only \$1 per month. The effect has been marked, large crowds have been drawn, and, considered from all points of view, the installation seems to be very successful. On Monroe street, which is about 80 feet wide, 12 arches had been erected, 80 to 90 feet apart, with 14 tungstens on each; and 5 more arches were to follow.

Big Rapids has followed suit and has erected 7 arches, with plans for 5 more. Each arch has 10 tungstens of 60 candlepower in series. Half a dozen other small towns in Michigan have taken up the matter. A popular differentiation from the pipe arch is the stringing of a span wire from pole to pole or from building to building, the tungsten lamps being suspended from the span. It all means additional income for the station, but there are objections made to the "canopy" plan. It puts the lamps up so high that a considerable portion of the illumination is spent on the upper stories of the buildings. The overhead network of wiring is an obstruction to firemen, and there is damage in the case of high winds. The contrasting method of low posts close together has its warm advocates, not merely because of its more permanent character and appearance, but as a revenue producer. Thus, at Minneapolis, the Publicity Club has brought about the lighting of Nicolet avenue, the main street of the city, with 64 standards, 8 to the block, 4 on each side of the street. The cost has been met by assessing merchants \$2 a front foot to cover installation and \$1.25 a year per front foot for maintenance. The posts are of cast iron, standing 14 feet above the ground, and are ornamental. Each carries four 12-inch alabaster globes and one 16-inch, all in a vertical position, each containing one 100-watt tungsten lamp. The advantages of the vertical arrangement of the lamps are minimum breakage, greater cleanliness, and larger lighting area. Each post is connected to the Edison 3-wire direct-current system of underground lead-sheathed cable. The retail cost of the posts installed is put at \$145 each, of which \$85 is for foundry work and \$60 for wiring, globes, lamps, and similar items. The Minneapolis General Electric Company runs the installation at a total inclusive charge of \$78 per post per year. All five lamps are switched on by an electrolier key switch in the post base, and after

midnight only the central lamp on top of the post is left to burn until daylight. As compared with a post system installed earlier at St. Paul, these standards are 2 feet higher and have arms 2 feet longer, while the tungsten lamp has added appreciably to the effective result obtained.

At Aurora, Ill., a somewhat similar scheme has been carried out, but there the tungsten lamps are carried in the downward burning position, except the central 60-watt one. No fewer than 173 posts have been installed, each carrying 3 lamps, except at each of the four corners of street intersections, where 5 lamps are used. The posts are 50 feet apart along each side of the street, on the curb line, one arm extending over the sidewalk, the other over the roadway. The plan originated with business men on the west side of the city, who organized the West Aurora Improvement Company. Proper ordinances were passed by the city council whereby the merchants could install and pay for the system and then turn it over to the city for maintenance and operation. Similar movements were started in other parts of the business district, and have culminated in a thorough lighting of the downtown section of the city. It is interesting to note that Aurora, in 1881, began at the other end of the methods of street illumination, with seven 150-foot towers, each carrying two large open arcs, high in the air, where they were imagined to give a "diffused moonlight," most of which in summer time at least, was intercepted from the sidewalks and roads by shade trees.

During the past four or five years there has been considerable advance in the use of electricity for the lighting of public parks, especially since the introduction of the tungsten lamp. In 1908 the New York Edison and allied companies developed a system of park lighting with tungstens and soon after placed large numbers of them in Riverside Park, on Riverside Drive, in Highbridge Park, and in St. Nicholas Park. These lamps are carried on ordinary posts at a height of over 10 feet from the ground. The lantern consists of three hinged interlocking sections, which provide socket and globe-holding devices, with means to clean and replace the lamps quickly as well as the reflectors and globes. To reach the posts, conduit and buried cable have been employed. The service switches control from 16 to 40 units equally balanced over the 3-wire network, and with slight modifications the system could be adapted to series alternating supply when used with a series transformer in either an arc or incandescent circuit. More recent modifications of this service include the lighting of Central Park with tungsten lamps.

In regard to street lighting it is interesting to note everywhere a greater interest in the beautiful aspect of the streets by day and night, and a desire not to spoil trees by bad trimming. At Los Angeles, Cal., the permits issued to the public-utility companies have printed on them in large type: "The trees must

be trimmed so as to preserve their symmetry," and this has led trimmers to give some attention to the nature of the tree and the peculiarities of its growth. One of the problems of suburban and rural development of lighting has been how to connect up various dwellings without excessive expense and without marring the attractiveness of the streets and foliage trees by pole lines. In some cities there are alleyways that can be utilized, but most cities are without these. At Rochester, N. Y., the Railway and Light Company has met the difficulty by erecting a pole line on the back-yard boundary line; and the other utility companies cooperate in maintaining the system. The company has deeded to it by the owner the ground on which the pole is erected, together with the right of free access at all times, and in turn it places on the streets a handsome type of arc lamp with standard of bishop's crook or swanneck form. In running the mains to these back-yard poles, high-potential lines are taken underground to a transformer in the man-hole nearest the street, and thence low-potential circuits are run to a manhole in the street opposite the pole lines, whence they branch and run underground to the end pole on either side. The mains are then brought up through conduit to the cross-arm. Service connections are made to the mains and brought in overhead to the rear of the houses, and the front of the property is left free from unsightly wires and service connections. The pole line extends from block to block, depending on the number of houses connected. No trouble has been experienced in getting the necessary concessions, as the plan is a benefit to the neighborhood.

Incidentally the tungsten lamp has already brought with it a number of auxiliary and supplemental devices and methods, such as socket adapters, reflectors, fixtures, and small transformers. In the new ballroom of the Hotel Astor, New York, where 1,200 people can dine or 2,500 can dance at one time, the lighting is done with some thousands of small low-volt tungsten lamps associated with small group transformers receiving current from motor-generator sets. At the twenty-fifth anniversary dinner of the American Institute of Electrical Engineers in the old ballroom of the same house in March, 1909, some 50 large tables were each beautifully illuminated with miniature tungsten lamps fed by a small storage battery set in a low metal vase on each table. Over the battery and lamps was placed a block of glass simulating ice, with a number of holes filled with water in which was set a mass of blush roses and maidenhair fern. The softly brilliant effect obtained would, it is said, have been impossible with carbon-filament lamps. Moreover, it was not necessary to wire each table for local lamps.

An evidence of the activity in the electric-lighting industry is the constant stream of novelties. Of these, the helion lamp is one for which an early commercial perfection is predicted. The carbon-silicon filament of this lamp has been brought to a point where it can

be burned in open air at practically the specific consumption of an ordinary vacuum carbon lamp. An interesting quality of the filament is its extraordinary high specific resistance, which is nearly thirty times that of the carbon filament and several hundred times that of tungsten. Particles of it are so hard that they will scratch glass.

The present report includes data as to the extension of the use of Nernst or "glower" lamps. The introduction of the metallic-filament incandescent lamp has by no means operated to eliminate this lamp, which has many desirable features of its own. The vogue of the glower lamp is also due to the fact that new units have been developed, considerably better in efficiency than the old. Coincident with the improvements in the glower came the development of the single-glower renewal screw burner, making the renewal of the lamp the same practically as in standard incandescent practice. This has resulted in the introduction of the screw-burner principle into chandeliers; and the new fixtures of that type are characterized by economy of space and high illuminating power. A number of large stores and other establishments have adopted the glower form of illuminant. The Marshall Field store in Chicago, with 25 acres of floor space, is an example, the details of the lighting of which were made public in October, 1907, by Mr. F. J. Pearson, electrical engineer of the dry-goods company, from which report the following is taken:

Tests of various lighting systems were carried on over a period of eighteen months. While the illumination calculated from the photometric curves of individual lamps, as well as measurements of illumination at the counter level in the actual installations, was made use of in comparing results, far more value was attached to visual tests made by comparing the general appearance of large rooms or sections of rooms lighted in different ways. To show the multiplicity of requirements, it is stated that there were 350 sections in the store, nearly every one of which had a different class of goods, and therefore presented somewhat different requirements. It was therefore necessary, if uniformity throughout the store was to be secured, to select a compromise system which would meet fairly well all requirements. The general plan of testing the different illuminating systems offered by the different manufacturers was to take a large room about 150 by 250 feet, and equip one-half of it with one lighting system and the other half with another. This was thought to be the best way to bring before the non-technical public and the sales managers the relative effects and efficiencies of the various systems. Glower lamps on short chain pendants were finally selected for lighting the establishment, with an average illumination in the foot-candles as follows: All above the first floor, 2.5 to 3; the first basement, 3.5 to 4; second and third basements, shipping and packing departments, 2.25 to 2.5. Arc lamps were not seriously considered,



ROOM IN NEW YORK POST-OFFICE LIGHTED WITH VACUUM TUBES.

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because it was stated that not 10 of the 350 section managers wanted to sell goods under them. The selection of the glower lamp was made because of low maintenance cost, color, and good general effect, as indicated by the preference of the management and the section managers.

The Moore tube system of vacuum lighting has also made progress, not only in the design of apparatus, but in the use of the tubes when provided with carbon dioxide, and is valuable in business establishments where color values are a main consideration. The long-loop tube system has been standardized into a "hair-pin" form, and there has also been developed a "straight-run" form, i. e., one end of the tube does not reenter the terminal box. The entire mezzanine floor of the New York Post-Office has been very successfully fitted up with tubes in 35 parallel rows, each 114 feet long, placed immediately against the ceiling.

Where the peculiar color is not objectionable, a large amount of miscellaneous lighting has been done with the mercury vapor lamp, which was in 1901 introduced to public notice by Dr. Peter Cooper Hewitt. He has since developed the same principle in the mercury arc rectifier, now also used largely to rectify alternating current into direct for various services, and especially for charging storage batteries. The lamp is a glass tube about 1 inch in diameter, on 110-volt circuits about 4 feet in length, and the light is obtained by vaporizing with the current the small quantity of mercury that the lamp holds. Dr. Louis Bell gives a specific consumption of 0.6 to 0.8 watt per equivalent candlepower for these lamps. The light is practically without red rays, but is strongly actinic and is therefore largely in use for photographic purposes. Mercury vapor lamps have been constructed with tubes bent into a circular form, so as to fit in a diffusing globe, and in some cases incandescent lamps have been added in the fixture for the purpose of supplying the red rays missing in the mercury vapor light. A prominent example of commercial lighting by units combining a mercury vapor lamp with a tungsten incandescent lamp is found in the editorial offices of the New York World, where 36 such units have been in use since May 1, 1908. Each combination consists of a mercury vapor tube bent into circular form of about 10 inches diameter, with a tungsten lamp in the center. The vapor tube and tungsten lamp are attached to an ornamental metal fixture provided with a white corrugated reflector and surrounded by a 16-inch holophane hemispherical globe. The combination lamp is designed to operate on the 120-volt circuit, and to take a current of 2 amperes, thereby consuming 240 watts. The vapor tube and tungsten lamps are connected in series, the vapor tube taking about 52 volts and the tungsten lamp about 58 volts. The remaining 10 volts are taken up by steadying inductance. An automatic device consisting of an inductance coil with a quick mercury break in vacuum,

called a "shifter," is placed in the fixture for starting the lamp. Tests of the illumination produced by this installation, made by means of a luminometer, and of the power consumed, show that the candlepower of the tungsten lamp is about 80 and of the vapor lamp about 200. With a power consumption of 240 watts, this gives an equivalent specific power consumption of 0.86 watt per equivalent candle.

The quartz mercury vapor lamp has also become a commercial success and is in use in Germany. Its formidable powers of competition may be inferred from the fact that with the mercury arc playing in a quartz tube it is possible to raise the temperature very much higher than can be done in a glass tube. The maximum is reached at about 1 watt per candle, and afterwards the specific consumption decreases rapidly down to about 0.16 watt per candle.

*Electric power.*—As the statistics show, the intercensal period witnessed a phenomenal development in electric-power supply, or motor service. If it were not for their motor day load, many central-station companies would doubtless find themselves in difficulties. One problem, of course, is to prevent overlapping of the lighting and the motor loads, and this has been worked out in one way under the Gossler system as adopted in Montreal, Canada, and in various cities of the United States. In 1894 the Royal Electric Company of Montreal was supplying the equivalent of 14,700 16-candlepower lamps and 50 horsepower in motors; while the total number of its customers did not exceed 300, and none of the various heating appliances were heard of. In 1907 the Montreal Heat, Light and Power Company had connected to its system the equivalent of 450,000 16-candlepower lamps, about 37,000 horsepower in motors, and upward of 1,000 appliances for heating, cooking, refrigerating, and so forth. The company served upward of 13,000 consumers of electricity and about 50,000 consumers of gas, or a total of nearly 70,000 consumers. The nonpeak users under this system are encouraged by a special concession of rates. It was found that about 40 per cent of the company's customers could be shut off from obtaining energy at the time of peak load without detriment to them. Among the loads were 3,500 horsepower in cotton mills, which in order to obtain the concession start operation at 7 a. m. instead of 8, allow only half an hour for lunch, and are thus able to stop work at 4.30 p. m. The operatives in many instances prefer to work during these hours and go home early than to begin later and finish later. Among the off-peak customers were the various morning and afternoon newspapers, to which the company supplied upward of 400 horsepower. Another class of customers were the brickyards, which required a summer service exclusively, and secured a 50 per cent reduction from the regular rates on seven months' operation. The amount of horsepower involved was 600 to 700, used in driving casting machines, mixers, and

conveyors. Other nonpeak users were the local water-power company, which used 1,200 horsepower in pumping drinking water; a railway-appliance company, which used 500 horsepower; cement works, which in 1909 used from 5,000 to 6,000 horsepower; and various wood yards. In the wood yards all the cutting was done during two or three hours of each day. The nonpeak rates were given to customers consuming relatively large amounts of power. An installation of 20 to 25 horsepower would be about the limit below which the nonpeak rate would not be granted. Extensions of the system have been carried out since the above data were obtained.

The extent to which electrical energy is now sold for power purposes is illustrated by the railway contracts made by the Commonwealth Edison Company of Chicago, which has been particularly energetic in reaching out for this class of business. Under the ten-year bulk contract with the Chicago City Railway, for example, the energy is supplied by the power company to the railway company in the form of a 3-phase, 25-cycle, 9,000-volt current. The railway company pays a minimum, primary, readiness-to-serve charge of \$1.25 per kilowatt of demand per month. The kilowatts demanded are taken as 21,000 as a minimum for the first year of the contract and as much more as may be demanded. For the remaining nine years of the contract the railway company pays according to the following provisions for determining the maximum demand: The railway company's maximum demand in kilowatts for each month, upon which the primary charge is made, is determined by taking three consecutive days in the month, out of which there are selected two hours, of which one is the hour of greatest output in kilowatt hours in the first half of the day and the other the hour of greatest output in the second half of the day. The combined output for the six hours selected in the manner thus indicated must be greater than the combined output of six hours similarly selected from any other three consecutive days in the month. One-sixth of the aggregate number of kilowatt hours consumed by the railway company during the six hours selected is considered as the number of kilowatts constituting the railway's maximum demand. If the railway's maximum demand exceeds 21,000 kilowatts during the first year, the railway is to pay \$1.25 per kilowatt of demand for each month for all in excess of the amount named.

The applications of electric motors on central-station circuits are now so numerous that it is useless to attempt to enumerate them all. The motors find employment in every industry and have seriously modified methods in some classes of work. A notable instance of their use outside of manufacture is furnished by the electrically operated high-pressure water systems for fire protection in the boroughs of Manhattan and Brooklyn, New York, for which the city appropriated over \$5,000,000 for the whole work. The

pumps are operated by induction motors, the aggregate rating for those installed in the four stations being 15,000 horsepower. Either salt or fresh water can be used, although up to the present time only the latter has been admitted to the mains. The systems are very extensive, that on Manhattan Island comprising about 63 miles of mains varying in diameter from 12 to 24 inches. The five pumping units in each station will deliver 5,000 gallons per minute against a discharge head of 300 pounds per square inch when operating at 750 revolutions per minute, with a suction lift not exceeding 20 feet. The pumps can be brought from standstill up to full speed in thirty seconds; and the company is under a contract penalty of \$500 per minute if it fails in three minutes after an alarm is given to furnish the proper and adequate motor service. The readiness-to-serve charge is \$24 per year per kilowatt of the kilowatt rating of the motors and 1½ cents per kilowatt hour for energy actually used.

The Brooklyn Edison Company receives \$3,660 per month for its readiness to serve and 1½ cents per kilowatt hour for current used. The cost of the two Brooklyn stations and equipment was about \$300,000. The interest on the city investment and cost of maintenance will approximate \$78,000 yearly, while the reduction in insurance premiums in this borough is placed at \$300,000 per annum. It is work like this that gives an idea of the loads that are being taken up to-day by large central-station systems throughout the country; and the \$500-per-minute fine does not appall them, so reliable have such systems become.

A special example of the development of motor service from central stations during the intercensal period is found in its use for refrigerating, where the motor drives the localized cooling apparatus and the use of ice is dispensed with. Several plants of this kind are being operated in Philadelphia, ranging in capacity from a quarter ton of ice, driven by a 1-horsepower motor, up to 35 tons, driven by a 75-horsepower motor; and in some instances there are several units in the same plant. During 1907 the connected load of this character on the circuits of the Philadelphia Electric Company increased 217 per cent, represented by over 230 ice-tons capacity of refrigerating machinery. In the year named the company was operating refrigeration machines in saloons, grocery stores, residences, drug stores, dairies, butcher shops, and restaurants, and it has since added to this list the establishments of florists, candy makers, ice-cream makers, fish and game dealers, pork packers, hospitals, bottlers, and fruiterers, and the equipment for cooling drinking water in office buildings. The yearly bill has been found to vary from 4.3 to 9.2 times that for the highest month and from 5.5 to 14.8 times that for the month of June. This relation is modified somewhat by the differences in temperature of the different localities. Electricity is also employed to operate brine pumps and deep-well pumps, and the auxiliary-motor service

of this kind connected in 1907 showed an increase of 284 per cent.

Early in 1907 one of Philadelphia's leading firms of florists decided to adopt mechanical refrigeration. They had a display case 16.5 feet long, 9 feet high, and 42 inches wide, embracing about 500 cubic feet, with three shelves, drawers below, and an ice bunker above. The flower jars and vases held probably 200 to 300 pounds of water, which was renewed daily. Four 16-candlepower lamps, placed so as not to be seen by the observer, were kept burning in the case above and in front, in order to illuminate the display properly. Openings in the floor of the main case permitted the cold air to circulate down to and around the smilax and other green stuff kept in the drawers below. Both doors and drawers were opened frequently, averaging probably four times per hour each. Under these conditions it was found necessary to use 500 to 700 pounds of ice each day to maintain a temperature of 44 or 45 degrees. The annoyance and inconvenience of handling were great, and the ice bill for one year was \$501. A 1-ton plant driven by electric motor was installed at a cost of \$1,000, and the first year's saving direct was \$34.

Refrigeration suggests ventilation and the motor fan. Central-station companies have generally ceased to make any attempt to enumerate the fans on their circuits, though in some cities the figures are kept. In 1908 the companies in New York City reported that they had about 250,000 fans on their circuits, which furnished an appreciable and profitable day "load" during the summer months. The Philadelphia Electric Company estimated the number on its circuits at about 10,000, and a summer income from them of more than \$20,000. St. Louis claimed at least 10,000 on central-station circuits; Providence, 5,000; Buffalo, 2,000; and Denver, 1,500.

The automobile load is a class of business in which, more or less directly, the modern central station supplies current to motors, several thousand machines now being operated by charging from the circuits. A typical example of what can be done is found in Toledo, Ohio, where the Railways and Light Company makes a charge of 3 cents per kilowatt hour to all public garages and repair shops, and 5 cents to private individuals, or a minimum bill of \$3 per month to both classes. The result is that in Toledo there were in 1908 about 500 electric automobiles, and 9 public garages and 85 private ones using electricity. The company sold mercury arc rectifier sets at \$230 for 30 amperes, including installation, and made a reduction of \$20 when the owner installed the rectifier himself. The rectifier is said to cause an average reduction of about 40 per cent in kilowatt hours consumed as compared with charging through a rheostat. The income to the company was about \$48 per year per vehicle in use in the city. One of the garages in the city could charge 48 vehicles at once, and 60 to 75

were charged by it in a single night. Its rates were \$22.50 per month for charging, keeping, washing, and delivering an electric coupé. Another garage had some 80 vehicles on its regular list. It charged \$20 per month for keeping up an open vehicle and \$22.50 for a closed one.

*Electric heating and cooking.*—Great advances were made during the intercensal period 1902–1907 in the arts of electric heating and cooking, although the present report is practically without data of a statistical character in regard to the extent to which the various devices for these purposes have found a place on central-station circuits. For many years such apparatus was costly, easily deranged, and very uneconomical in its consumption of current; but these defects have been removed. While electric heating and cooking can not yet compare in general cheapness with older methods, including the use of gas, electricity has already made a place for itself in innumerable special instances and over a wide variety of industrial and domestic work. Moreover, the high efficiency metallic-filament incandescent lamps, by their smaller consumption of current, have put central-station managers on the alert to dispose of the surplus plant and electrical energy thus left idle on their hands. As a result there has been a really enormous stimulation of activity in this newer field. The progress that is being made may best be ascertained from the statements of some of the central-station operators who have studied the novel problems involved. One great advantage of electrical apparatus of this class is that it can be used with equal success on either direct or alternating current. It needs only to be fed with the proper amount of current from the supply circuits, without any particular adjustments except those for protection against fire and other accidents.

At the Ohio Electric Light Convention, held during the summer of 1907, Mr. M. E. Turner gave some interesting data about the use of electrical apparatus for cooking in Cleveland. He stated that it was not possible to obtain complete figures from all users, but the following reliable data were collected from 11 homes using complete cooking outfits:

| ELECTRIC COOKING.                   | Number of residence. | Full months of use. | Average number of people cooked for. | Average kilowatt hours used per month. | Average per month per person. |
|-------------------------------------|----------------------|---------------------|--------------------------------------|----------------------------------------|-------------------------------|
| Total, exclusively and in part..... |                      |                     | 62                                   | 1,209                                  | 20                            |
| Exclusively.....                    | 1                    | 11                  | 7                                    | 237                                    | 1.34                          |
| Exclusively.....                    | 2                    | 6                   | 3                                    | 85                                     | .28                           |
| Exclusively.....                    | 3                    | 5                   | 3                                    | 62                                     | .21                           |
| Exclusively.....                    | 4                    | 2                   | 7                                    | 171                                    | .24                           |
| In part.....                        | 5                    | 1                   | 3                                    | 34                                     | .11                           |
| In part.....                        | 6                    | 2                   | 5                                    | 47                                     | .09                           |
| In part.....                        | 7                    | 2                   | 7                                    | 68                                     | .10                           |
| In part.....                        | 8                    | 2                   | 4                                    | 40                                     | .10                           |
| In part.....                        | 9                    | 4                   | 6                                    | 34                                     | .06                           |
| In part.....                        | 10                   | 5                   | 8                                    | 380                                    | .45                           |
| In part.....                        | 11                   | 1                   | 9                                    | 71                                     | .08                           |
| Total exclusively.....              |                      |                     | 20                                   | 555                                    | .28                           |
| Total in part.....                  |                      |                     | 42                                   | 654                                    | .16                           |

<sup>1</sup> Includes laundry ironing and water heating.

<sup>2</sup> Includes laundry ironing.



These figures indicate that with the growth of this branch of the business an increased energy consumption of from 100 to 200 kilowatt hours per residence per month may be expected. In Cleveland a two-rate method is used for billing residences, and the users of electric heating generally received the benefit of the secondary or lower rate. In fact, the cooking in all the 11 residences cited was done at a 5-cent rate. The expense under these conditions compares favorably with that for manufactured gas, and the fact that over 1,100 electrical-heating devices were sold in Cleveland by the local illuminating company alone during the twelve months preceding June, 1907, illustrates how popular electrical-energy consuming devices were becoming in the home. These sales were made through newspaper advertising and through the efforts of one salesman, and toward the close of the period named over 100 such devices a month were being sold without any direct solicitation. The results from June, 1907, down to the date of writing are equally striking.

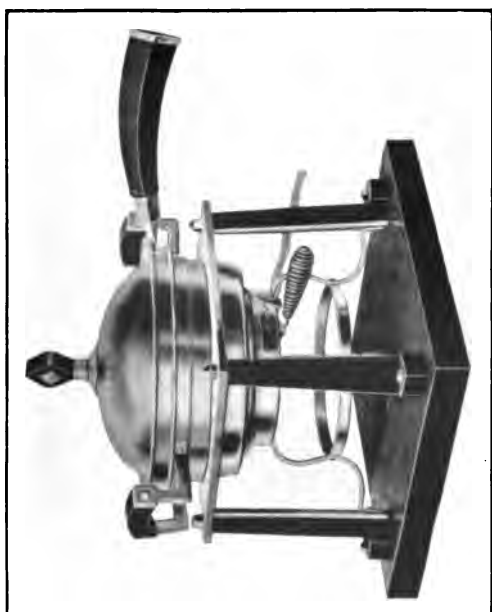
At the meeting of the Northwestern Electrical Association in Milwaukee during the spring of 1908, Mr. E. I. Callahan presented the advantages of an electric-heating load, and suggested some methods of securing it. He knew of no easier way by which companies could secure the desired result of getting more revenue with existing investment than by pushing the use of heating devices. Many of these devices, he claimed, were simple enough to be used in nearly every room in the house, by anyone, and could be connected to the usual receptacles provided. The central stations could usually supply 75 per cent of the load demand without providing increased transformer, meter, or plant capacity. He suggested that central stations not operating day circuits follow the example set by several managers, and for a trial start day circuits to operate all day on Tuesday, ironing day. Small motor loads would then spring up and the plants would soon be forced to operate every day in the week. As to soliciting business, he suggested that personal solicitation, although the most expensive advertising, was by far the most productive. He gave the results of cooking by electricity in his own home, in which for a period of a year the watt hours per person per meal averaged 264, with a maximum demand of about 2.8 kilowatts. Mr. J. R. Cravath, from his own experience, confirmed these figures, and stated that his maximum demand was about 3 kilowatts, inclusive of ironing. Mr. Korst, of Janesville, Wis., stated that about half of the residence customers of his company had flatirons, and that a very good revenue was derived from this source, especially during the summer months. He found, however, that when the bills crept up in the winter time, customers were apt to use their old irons heated on the coal ranges. In the summer many customers' bills, exclusive of the ironing, would fall below the \$1 minimum

per month. The use of the electric flatiron would bring the bills a little above \$1, which would give the company more revenue, and better satisfy the customer because he thereby avoided paying for something he did not get. The flatiron also induced persons who were not previously customers to have their houses wired. Mr. R. N. Kimball, of Kenosha, Wis., said he had at first attempted to introduce flatirons by having a demonstrator in the office, but that he did not get much business that way. The demonstrator was then sent out to canvass the residences, and the results were very much better. Fully 75 per cent of the irons sent out on trial were kept and not returned to the office.

At its Grand Rapids convention in September, 1908, the Michigan Electric Association received the report of a special committee which had canvassed the central stations of the state as to the results obtained with electric heating and cooking. In general, the data as to progress were similar to those given above. Next to the flatiron in popularity and as income earners were the toasters, water heaters, and luminous radiators. Most stations reported the toasters and luminous radiators as equal in popularity, some of them having as many as 150 of each on their lines. The sale of chafing dishes, percolators, heating pads, and other devices seemed to be limited, either by reason of their first cost or infrequency of use.

Another field of operations reported on by the committee named was that of the commercial heating of such appliances as gluepots, solder pots, soldering irons, and branding irons. Perhaps the greatest drawbacks to the introduction of electrical devices for the work indicated have been the high initial cost and the frequent burn-outs. Very few of the stations reported any great advances in the introduction of cooking outfits. For this the initial cost of the outfits and devices seemed to be mainly responsible, since even with such a rate inducement as 2.5 cents per kilowatt hour, as established at Sault Ste. Marie, no great amount of business was reported in this line. Other drawbacks to the electric-cooking outfit were its limited reserve capacity for the average family, and the inability of any yet known devices to heat enough water for the average household at anywhere near a reasonable price. The committee thought that before the electric-cooking outfit could be a success it would be necessary to furnish to the public devices that were not only fireproof, but more efficient, longer lived, and of lower initial cost. Tests had shown considerable saving by the use of the fireless cooker in connection with electric outfits, and many of the stations were already introducing and recommending them. Indeed the whole art was declared to be in a state of such rapid transition and improvement that criticisms valid at one time soon become of little weight.





TYPICAL ELECTRIC CHAFING DISH.



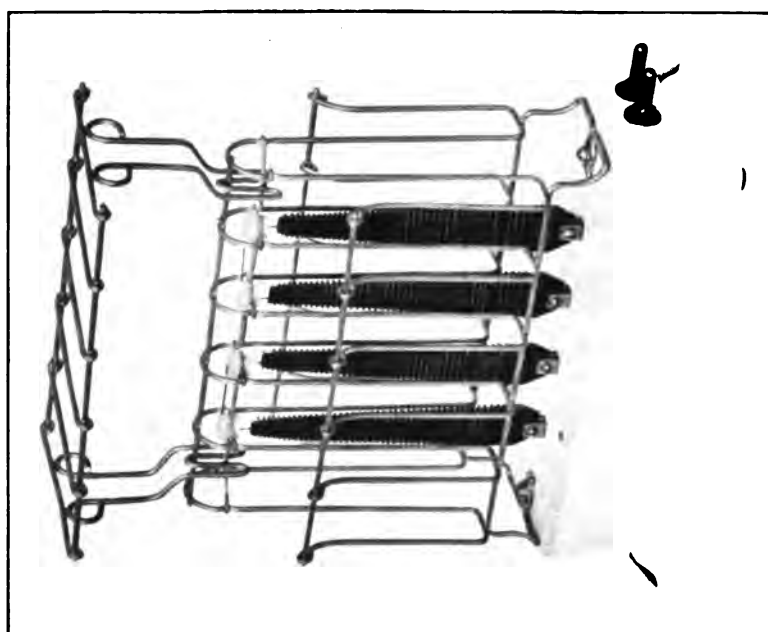
ELECTRIC FLATIRON.



ELECTRIC COFFEE PERCOLATOR.



ELECTRIC OIL-TEMPERING BATH.



ELECTRIC TOASTER WITH WARMING SHELF.

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*Electric meters.*—According to the data given in Chapter IV on line equipment, there were 1,683,917 meters on central-station consumption circuits in 1907 as compared with 582,689 in 1902, the gain being not less than 189 per cent. If meters on electric-railway lighting systems are included, the number in 1907 was 1,897,803, representing a gain for the intercensal period of 196.9 per cent. Such figures furnish a clear indication of the rapidity with which the old practice of selling electricity on a flat-rate basis is being abandoned. It is true that a great deal of electricity is still sold by rough estimate, at an arbitrary price per lamp per year, or per horsepower of motor, and it is also true that modified flat-rate systems of payment have enjoyed some degree of favor; nevertheless, it is probable that no progressive central station of any size can be found that does not employ customers' meters, and the customers themselves, as a general rule, prefer to buy current that is measured. To show the importance attached to the subject, it may be mentioned that the report of the meter committee of the National Electric Light Association, presented in 1909, was a document<sup>1</sup> of over 300 pages; and to that exhaustive report special students of the subject are referred. The report was based on information received from the member companies, and included descriptive data concerning meters in general use on central-station consumption circuits.

The statistics in Chapter IV do not distinguish between types of meters or attempt to give their capacity. The answers given by the companies showed that some of them are still using the older commutator type of watt-hour meter, as well as the induction type of ampere-hour meter on alternating circuits. It was formerly considered that the commutator type of watt-hour meter was equally suitable for both direct and alternating current circuits; and, indeed, when the meter was properly "compensated," it did register with equal accuracy, in the majority of cases, on both kinds of service. At the present time the commutator type of meter is considered as a direct-current meter, while the induction watt-hour meter is regarded as preferable for alternating-current consumption circuits. It was found that while the ratio of meter capacity to connected load varied among the member companies, yet, considered as a whole, it was not far from 1 to 1—that is, 1 kilowatt of meter capacity is installed for each kilowatt capacity of connected load. It is but seldom that the peak load exceeds 30 to 60 per cent of the connected load and the generators seldom exceed 70 per cent of the connected load. It would appear from the following table that, on the average, the smaller companies had installed about 1.4 kilowatts of meter capacity for each kilowatt of generator capacity:

<sup>1</sup> Proceedings, National Electric Light Association, 1909, Vol. I, p. 257.

| KIND OF SERVICE.        | Number of meters. | METERS INSTALLED.       |                                          |                                              |
|-------------------------|-------------------|-------------------------|------------------------------------------|----------------------------------------------|
|                         |                   | Average cost per meter. | Average capacity per meter in kilowatts. | Average cost per kilowatt of meter capacity. |
| Mostly residential..... | 600               | \$11.75                 | 0.91                                     | \$12.91                                      |
| Mostly business.....    | 5,000             | 13.35                   | 1.69                                     | 7.90                                         |
| General.....            | 10,000            | 14.20                   | 3.08                                     | 4.63                                         |
| General.....            | 20,000            | 13.60                   | 3.46                                     | 3.93                                         |

Assuming the cost of generators for smaller plants to average \$12 per kilowatt and the cost of meters \$8 per kilowatt, it will be seen that the cost of meters is not far below the cost of generators.

As an evidence of the effect of improved meter practice upon the average accuracy of meters, and the consequent influence on the revenue, the following table, received from a member company, was presented in the report referred to above. This company, supplying both alternating and direct current, replaced in all direct-current meters the stationary shunts with adjustable shunts, equipped all direct-current meters with diamond jewels, replaced all commutator meters on alternating-current circuits with induction meters, substituted modern meters for many of the older type, and improved its system of testing, with the following results:

| YEAR.     | Meters in service December 31. | Tenth load accuracy, per cent. | Heavy load accuracy, per cent. | Number of meters tested. | Per cent of meters tested. |
|-----------|--------------------------------|--------------------------------|--------------------------------|--------------------------|----------------------------|
| 1902..... | 3,400                          | 84.4                           | 92.0                           | 1,868                    | 53.5                       |
| 1903..... | 4,165                          | 81.5                           | 94.0                           | 2,980                    | 71.5                       |
| 1904..... | 4,952                          | 84.2                           | 95.1                           | 3,556                    | 71.8                       |
| 1905..... | 5,861                          | 87.9                           | 96.1                           | 4,044                    | 69.0                       |
| 1906..... | 6,964                          | 90.3                           | 97.1                           | 4,086                    | 58.6                       |
| 1907..... | 8,060                          | 92.2                           | 97.5                           | 6,942                    | 86.1                       |
| 1908..... | 9,276                          | 94.1                           | 98.1                           | 10,558                   | 113.8                      |

As indicative of the condition of meters not tested for from two to five years, the following table, showing the results of testing the 192 meters of a small company was also presented:

| PER CENT.                      | LIGHT LOAD.       |           | FULL LOAD.        |           |
|--------------------------------|-------------------|-----------|-------------------|-----------|
|                                | Number of meters. | Per cent. | Number of meters. | Per cent. |
| Total.....                     | 192               | 100.0     | 192               | 100.0     |
| Above 20 fast.....             |                   |           | 2                 | 1.0       |
| Between 10 and 20 fast.....    | 1                 | 0.5       | 3                 | 1.6       |
| Between 4 and 10 fast.....     | 3                 | 1.6       | 8                 | 4.2       |
| Between 2 and 4 fast.....      | 4                 | 2.1       | 6                 | 3.1       |
| Between 2 slow and 2 fast..... | 24                | 12.5      | 54                | 28.3      |
| Between 2 and 4 slow.....      | 13                | 6.7       | 45                | 23.3      |
| Between 4 and 10 slow.....     | 36                | 18.7      | 38                | 19.8      |
| Between 10 and 20 slow.....    | 44                | 22.9      | 12                | 6.2       |
| Over 20 slow.....              | 18                | 9.4       | 5                 | 2.6       |
| Not recording.....             | 49                | 25.6      | 19                | 9.9       |

It is evident from the above tables that the financial success of a company may be vitally dependent upon the testing of its meters, and it is obvious that the consumer has an equally large interest in securing the highest possible accuracy in the apparatus upon which alone the cost of service to him depends.

In Massachusetts a customer of an electric-light company or the company itself may apply to the Board of Gas and Electric Light Commissioners for an examination and test of any meter in use, the board furnishing the applicant with a certificate of the result of the test and the expense attached thereto. If the meter is inaccurate, the board may order the company to repair it or substitute an accurate one. All fees for examinations and tests are paid by the applicant, but if the examination is made at the request of the customer and the meter is found to register too fast, the electric-light company is responsible for the fees. The meter is deemed to be correct if it does not vary more than 5 per cent from the standard approved by the board. The inspector employed by the board receives a salary, together with necessary traveling and other expenses. The aggregate amount, however, must not exceed \$3,000 in any year. Should the amount of compensation and expense exceed the amount of fees received, the excess is assessed upon and recovered from the electric-light companies. The board establishes rules and regulations, fixes standards, prescribes fees, and employs such means and methods for making examinations and tests of meters as in its judgment are most practicable, expedient, and economical. The fees charged for testing of various-sized meters in 1907-8 in New York, Massachusetts, and Canada are given in the accompanying table.

| METER RATING.      | RATES FOR TESTING WATT-HOUR METERS. |                |         |         |
|--------------------|-------------------------------------|----------------|---------|---------|
|                    | New York.                           | Massachusetts. | Canada. |         |
|                    |                                     |                | Lamps.  | Meters. |
| 3 amperes.....     | \$1.00                              | \$1.50         | \$0.75  | \$3.00  |
| 5 amperes.....     | 1.00                                | 1.50           | 0.75    | 3.00    |
| 10 amperes.....    | 1.50                                | 1.50           | 1.25    | 3.00    |
| 15 amperes.....    | 2.00                                | 2.00           | 1.75    | 3.00    |
| 25 amperes.....    | 2.50                                | 2.50           | 2.75    | 3.00    |
| 50 amperes.....    | 3.00                                | 3.00           | 3.50    | 3.00    |
| 75 amperes.....    | 4.50                                | 3.50           | 5.00    | 6.00    |
| 100 amperes.....   | 5.50                                | 3.50           | 6.50    | 6.00    |
| 150 amperes.....   | 8.00                                | 4.00           | 9.00    | 9.00    |
| 200 amperes.....   | 10.50                               | 4.50           | 11.50   | 12.00   |
| 300 amperes.....   | 15.50                               | 4.50           | 16.50   | 18.00   |
| 450 amperes.....   | 23.00                               | 5.00           | 24.00   | 27.00   |
| 600 amperes.....   | 30.50                               | 5.00           | 31.50   | 32.00   |
| 1,200 amperes..... | 60.50                               |                | 61.50   | 72.00   |

It will not be out of place here to note that by the provisions of the Canadian law a meter must be tested and stamped every five years. The meters to be tested are brought to the government inspection office, or in small towns and villages the test is conducted on the premises of the electric-light company. When a customer wants his meter tested, he notifies the electric-light company and requests it to send a qualified person to detach the meter from the mains so that it may be taken to the inspector's office. The inspector files with either the electric-light company or the customer, on payment of the proper fee, a certificate stating the result of the inspection, with such particulars as he may deem right to insert for the information and guidance of the persons concerned. Electrolytic meters in use may be continued unless objected to by the

purchaser, but all renewals of meters must be made by the substitution of direct-reading types. No meter is passed which, when working at its full rating, varies more than 3 per cent from the legal standard unit of electricity, in favor of either the electric-light company or the consumer. Whenever a reading of a meter is taken by the electric-light company, the company must give a duplicate of such reading to the consumer. In every case the owner must keep the meter in good repair and is responsible for the due inspection thereof.

Legislation in this general direction has been made effective in the control over meters given to such new "public-service commissions" as those in Wisconsin and New York, and steps have been taken by these commissions for the full examination of all meters and meter complaints. A report made public in 1909 by the New York commission of the first district of tests conducted in New York City showed a remarkably satisfactory state of affairs as to the general accuracy of meters in the district. Under the public-service laws of New York an electric meter is allowed a variation of 4 per cent either way, while a gas meter is allowed only 2 per cent.

The latest rules of the public-service commission for the city of New York relative to testing electric meters are embodied in printed forms. Forms are included for reports on complaint, periodic, and office tests of meters. The complaint test is defined as a test made by an electrical corporation, upon the premises where the meter is installed, as the result of a complaint of the customer. A periodic meter test is a test made by an electrical corporation in the regular course of its business, upon the premises where the meter is installed, but not at the time of installation, which test is not made as the result of a complaint from the consumer nor by special direction of the corporation or one of its officers or employees. An office meter test is a test made by an electrical corporation, upon the premises where the meter is installed, by special direction of the corporation itself or of an officer or employee.

The rules require that every electrical corporation operating within the first district shall file with the public-service commission a monthly report, in the form prescribed, stating the results of all tests of electric meters tested for accuracy during the month. Such reports must be made for each calendar month and be filed not later than the 15th day of the following month.

All tests are required to be made with the meter in its permanent position on the consumer's premises, and under actual operating conditions as regards voltage, frequency, temperature, stray fields, and vibration. Where shunts, series transformers, or shunt transformers are used in connection with a meter, the meter must be tested from the line side of such apparatus when the voltage does not exceed 600. In periodic tests, where the line voltage exceeds 600 volts, the meter may be tested as a self-contained meter,

and the ratio certificates of the transformers may be used in calculating the true line watts, provided the certificates are dated within the five years preceding the time the meter is tested. In complaint and office tests the commission will accept the ratio certificates of the transformers, provided they are dated within the year preceding the time the meter is tested. When rotating standard meters are used the connections must be so arranged as to give the meter tester full control of the starting and stopping of the standard and at the same time allow him to count the revolutions of the meter under test.

Each meter must be tested independently, and no meter can be tested while connected in series with one or more other meters unless the potential circuit of each meter is so arranged as not to be fed through the field of any meter under test or rotating standard. All indicating and integrating instruments used as standard instruments in testing meters must be equipped with scales properly proportioned to the loads measured.

All meters must be adjusted so as to register with an error of not more than 1 per cent at light load and at full load, and both of these adjustments must be maintained in this condition as nearly as possible. All meters, whenever possible, are to be tested at three loads: One-tenth of the full rated capacity of the meter, normal load, and full rated capacity of the meter. The average of these tests obtained by multiplying the result of the test at normal load by three, adding the result of the tests at one-tenth capacity and full capacity, and dividing the total by five is deemed the condition of the meter, and such final average must be reported to the commission on the form prescribed by it. In an installation where it is impossible to obtain a load of 10 per cent of the rated capacity, or of 100 per cent of the rated capacity of the meter, tests are to be made at the nearest obtainable loads to 10 per cent and 100 per cent, respectively, of the rated capacity of the meter, and the values are to be given in the ratios.

The following classification, in percentage of installation, is used in determining normal test load:

|                                                                                                    |              |
|----------------------------------------------------------------------------------------------------|--------------|
| A. Residence and apartment lighting.....                                                           | 25 per cent  |
| B. Elevator service.....                                                                           | 40 per cent  |
| C. Factories (individual drive), churches, and offices.                                            | 45 per cent  |
| D. Factories (shaft drive), theaters, clubs, entrances, hallways, and general store lighting ..... | 60 per cent  |
| E. Saloons, restaurants, pumps, air compressors, ice machines, and moving-picture theaters.....    | 70 per cent  |
| F. Sign and window lighting and blowers.....                                                       | 100 per cent |

When a meter is found to be connected to an installation consisting of two or more of the above classes of loads, the normal load used must be obtained by taking the average of the percentages for the classes so connected. Three tests are made at each load at which the meter is tested, but should any two fail to agree by 1 per cent, additional tests must be made

until three results are obtained which do not vary one from another more than 1 per cent.

At Hartford, Conn., an interesting variation in meter practice has been worked out by the Hartford Electric Light Company, in connection with the introduction of the tungsten lamp in smaller sizes, designed for operation at 30 and 60 volts. Tests have shown that these low-voltage, extra high-efficiency lamps can be counted on for a life of at least two thousand hours. The filaments are tough and thick and will stand rough handling admirably. During the past two years several installations of these lamps have been made in residence service, and as a result the company is satisfied that it is advantageous to introduce them generally on its circuits. In order to handle the situation profitably, however, the company has worked out a plan of charging the customer for light used rather than billing on the usual basis of a price per kilowatt hour.

The plan consists in the substitution of a meter dial reading candlepower hours for the ordinary watt-hour dial of the ordinary induction meter and in charging the customer a rate of 0.025 cent per candlepower hour of service supplied. The customer pays the initial cost of installing the lamps, which is 20 cents apiece for either the 10, 20, or 30 candlepower, 30 or 60 volt lamps. Free renewals are given on all these lamps. The company installs an "economy coil," or compensator, in each residence to reduce the potential from that of the mains to 30 or 60 volts, as the case may be. This compensator has the advantage of absorbing the effect of voltage fluctuations on the high-tension lines back of the subway transformers from which secondary groups of loads are fed, and it is provided with multi-voltage taps for convenience. Mr. Dunham, president of the company, states:

The whole system of meter measurement has gradually adjusted itself to a certain ratio between watts, or the power used in creating light, and the other costs entering into the production of the candlepower. This has been particularly the case with house lighting. The general average price of house lighting in the larger cities and in the older stations has become about 10 cents per kilowatt hour—that is, the whole cost of light is placed upon the kilowatt measurement, whereas more than one-half the cost consists of distribution management and "overhead" expenses. This is clearly shown by the fact that the same meter measurement of watts has an altogether different price when it is used simply as power. The price of power in the more modern stations and in the larger cities ranges from 2 to 6 cents per kilowatt hour, while the cost of light ranges from 4 to 12 cents, or about double the price of power, which would not be the fact if the customer paid for the same thing in both instances. For the power used the customer pays for the actual kilowatts, but for the light delivered the customer pays for the actual kilowatts used plus the various other expenses which have been attached by custom and necessity. This has placed all the stations in a peculiar relation to the old-fashioned watt-hour meters in regard to the new lamps, and they find themselves reduced in income, if they use the new lamps, to one-half of their old revenue. This can not be avoided except by changing the measuring instrument or by raising the price of the kilowatt hours used to double that charged for the old lamps, because the watt-hour meter measures a little less than half the actual cost of the candlepower.

*Regulation and rates.*—Various references have already been made in this chapter to the subjects of rates and regulation. It is well understood that in their dealings with the communities served, central-station companies have always been governed by the local-franchise ordinances under which they operated. But these franchises have dealt more with questions of public-street lighting than with such a feature as service to the private consumer; and it is in the latter respect that most change is noticeable of recent years. The change has been carried furthest in those states where public-service commissions exist, whose authority and control over public-utility corporations have been generously amplified by the respective legislative bodies delegating such powers. These states are notably Massachusetts, Wisconsin, and New York, but it is significant that, as a matter of record, in almost every instance where the commissions have been appealed to, the actions or methods of the corporations have been sustained; or if modified, the underlying principle has been adhered to as based on reason and equity.

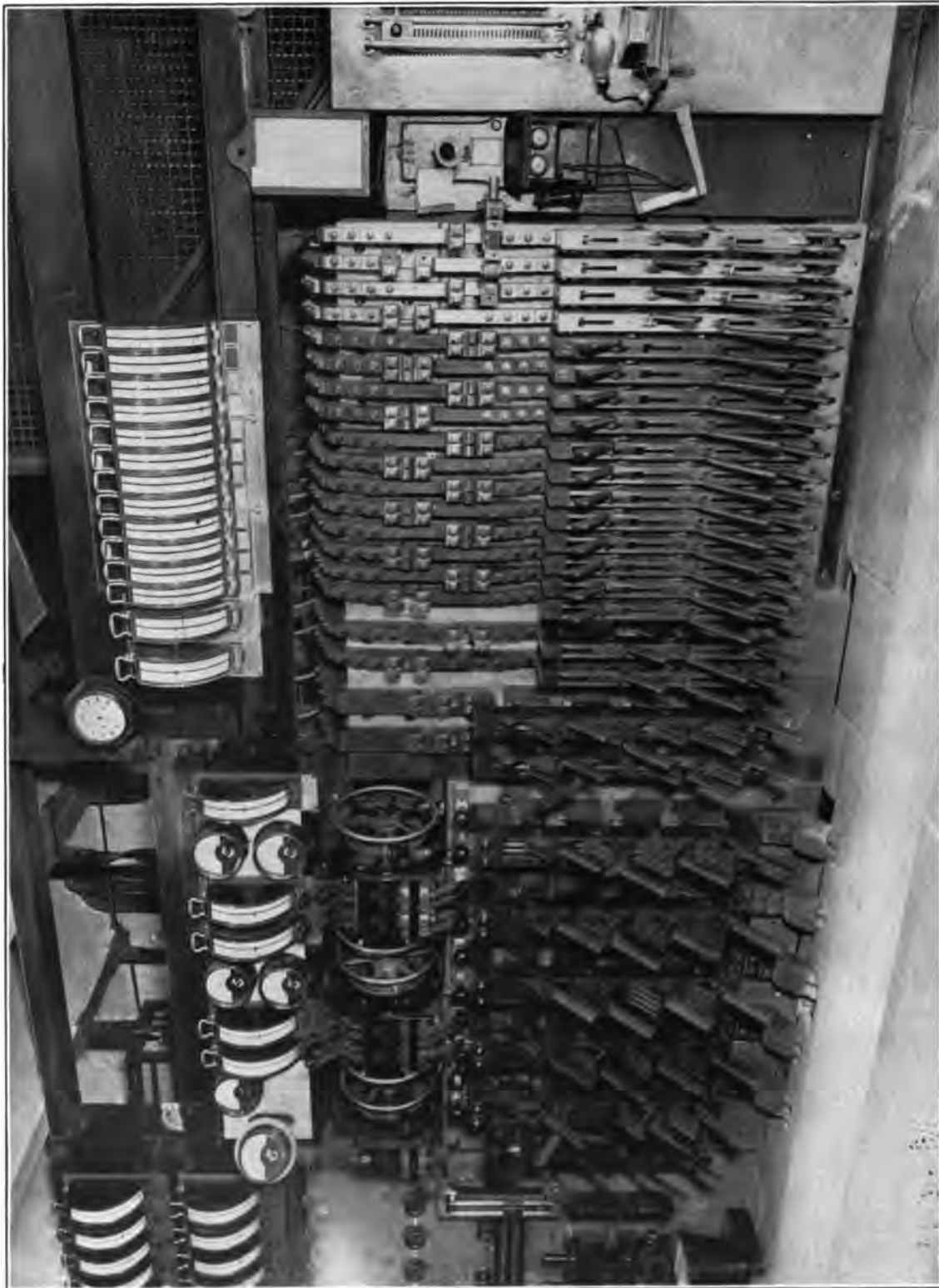
One of the most interesting recent cases is that in which the Wisconsin commission dealt with the application of the La Crosse Gas and Electric Company for the power to charge higher rates for electrical energy than had prevailed. The testimony and facts presented by the petitioner related mostly to the history of electric lighting in La Crosse, to the rates which the company was asking permission to establish, and to the various systems of fixed rates that were already in use. From the facts relating to the value of the plant and to its earnings and operating expenses, the commission said it was quite clear that the plant had not been a success as a producer of net earnings. This was especially true when some allowance was made for depreciation at 3 per cent. During the preceding two years the net earnings were not enough to pay any interest upon the investment nor even to meet ordinary depreciation charges, and so long as the rates charged for energy remained so low there was but little hope that the net earnings would increase. The decision included a discussion of one of the most important features of the problem—the cost to the company of serving each class of customers. It is not necessary to cite here the rates fixed, but the language of the decision is as follows:

It further appears that the proposed rates are somewhat lower than those charged in other cities, both inside and outside of this state. The comparisons we have made upon this point are quite extensive. They embrace at least 20 cities in Wisconsin and fully as many in other states. These facts are of considerable importance, not only to the petitioner but the people who are served by this company. The petitioner has duties as well as rights in this matter. While it is entitled to reasonable rates for service it renders, it has not the right to exact more than this. It must also see to it that the services it renders are adequate and that they meet all reasonable requirements in this respect. It is as important that the interests of the public it serves should be as fully protected as those of its own. The best rates are those that are based upon the cost. Each

customer should, under ordinary conditions, contribute his just proportion of all the expenses, as well as of the interest upon the investment. From the foregoing examination of the facts involved in this case it appears to us that the rates submitted by the petitioner fairly meet the situation, and that they are just and reasonable. It has been determined, therefore, that these rates shall be put into effect, subject, however, to such revision as may be found necessary when the plants in question have been appraised, or for other reasons.

At Minneapolis the city officials held that the rates of the Minneapolis General Electric Company were too high, and that the same rate per kilowatt hour, except for quantity discounts, should be made for all consumers without regard to conditions of load. The company had put in force a system of rates under which customers having the best load-factors—that is, those using current the largest number of hours per day—were given much the lowest rates. It appears from the reports of the early stages of the Minneapolis controversy that the city officials were chiefly concerned with lowering the maximum rates charged by the company for short-hour business. Several expert investigations were made into the company's affairs, with the result that the correctness of the company's theory of readiness-to-serve charges in connection with electric light and power business was upheld. The experts all agreed that the rates given to any individual customer should be dependent upon the fixed charges on the investment necessary to serve him, plus his share of the operating expenses necessary to serve customers in his class, rather than on the average expense of serving all classes of customers. However, as a concession to the smaller customers, it seems to have been generally agreed, both by the company and by the experts, that the maximum rates should be a little lower than those to which the smaller short-hour customers would be strictly and scientifically entitled. This reduction from the maximum rates to small short-hour customers was advocated only on the ground that the many small consumers, by the consent of whom the company had the use of the streets and public alleys for the distribution of its current, were entitled to receive compensation in this way for the franchise, and that larger consumers were not entitled to receive such compensation in the same proportion.

The Minneapolis General Electric Company and the committee of the city council came to an agreement on electric light and power rates as a groundwork for an ordinance giving the company a thirty-year franchise and fixing the rates for electric light and power for the first year of the franchise. The city council originally passed an ordinance requiring a uniform rate of 8 cents per kilowatt hour, with discounts purely according to quantity. The company refused to recognize this ordinance, on the ground that it was unjust, inequitable, and confiscatory. The point of interest in the controversy is that a company was able to convince a council committee and citizens of



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the fairness of a rate based on load-factor, and of the unfairness of a uniform rate per kilowatt hour for all classes of business.

The residence-lighting rate which was agreed upon is 9 cents per kilowatt hour for the first fifty-two hours' use per month of 40 per cent of the connected load, and 6.66 cents for all over that. Commercial lighting is at the same rate, except that the maximum demand as measured by maximum-demand meters is substituted for 40 per cent of the connected load. Maximum bills are 100 per cent of the connected load. Minimum bills are \$1 per month per lighting customer. Retail motor service pays 7.5 cents per kilowatt hour for the first fifty-two hours per month of the customer's maximum demand, and 2.5 cents for all over that. The minimum bill is \$1 per month per horsepower connected. The chief differences between these rates and the old rates of the company are that the maximum rate has been reduced on lighting from 12.6 cents for fifty-two hours' use of 60 per cent of the connected lamps to 9 cents for 40 per cent, and the minimum bill on motors reduced from \$2 to \$1 per horsepower. Free incandescent-lamp renewals and free arc-lamp maintenance have been abolished under the new rates. Quantity discounts from 5 to 25 per cent are to be allowed on accounts of from \$50 to \$250 per month.

Professor Cooley, one of the experts employed in the investigations, pointed out that light and power furnished under a limited-term franchise ought to cost the consumer more than that furnished under a perpetual franchise, because the company must figure upon paying off its bondholders and stockholders completely at the end of the limited-franchise period. A company could certainly float 4 per cent bonds on a perpetual franchise where with a limited franchise it would pay 5 per cent.

Rates were changed in one or two of the leading cities during 1907. The ordinance fixing the maximum rates to be charged by the Commonwealth Edison Company of Chicago, until 1912 was passed by the Chicago city council on March 23 of the former year. This company pays 3 per cent of its gross receipts to the city, in accordance with the franchise previously owned by the Commonwealth Electric Company. The rates are as follows: Up to July 31, 1908, 15 cents per kilowatt hour as a primary rate for energy used up to the equivalent of thirty hours' use of the consumers' maximum demand, and 9 cents per kilowatt hour as a secondary rate for all energy in excess of the foregoing amount. From August 1, 1908, to July 31, 1909, the maximum rate is 13 cents and the secondary rate 9 cents. From August 1, 1909, to July 31, 1912, the primary rate is 13 cents and the secondary rate 7 cents. A discount of 1 cent per kilowatt hour from the foregoing rates is to be allowed on all bills paid within ten days.

The Union Electric Light and Power Company, of St. Louis, has put in force a new system of rates, which differs considerably from the typical systems in use. It is founded on the belief that the value of the service rendered to any individual should, so far as practicable, be based on the cost of serving him, and not on the average cost of serving the entire body of consumers; and that as the cost of supplying current per kilowatt hour varies greatly with the different classes of service, so the price per kilowatt hour, in justice to the several users, should vary greatly to different customers. The company felt compelled to recognize the force of the argument of the customer who maintained that he was entitled to a lower average rate if he guaranteed \$5 per horsepower per month than his neighbor who would guarantee only \$1 per horsepower per month. At first a system of "special" contracts was adopted to meet this condition; but complaints of unequal discriminations led later to the substitution of a graduated schedule of rates. Under it the service is divided into a very much larger number of classes than was ever before attempted, and every consumer in the same class gets the same rate.

Each customer's rate is based on the minimum monthly guarantee he is willing to make per horsepower or per 50-watt lamp connected, and the rate is inversely proportional to the amount of the connected load. For example, the customer having fewer than 100 lamps pays 12 cents per kilowatt hour if he guarantees only 10 cents per month per lamp. By guaranteeing 45 cents per month per lamp he gets a rate of 10 cents per kilowatt hour, and by guaranteeing 65 cents per month per lamp, a rate of only 8 cents per kilowatt hour. Of the customers furnishing the 10-cent guarantee there are 15 subclasses, each with its own modified rate. The rate also declines as the number of connected lamps increases. For example, a customer guaranteeing 10 cents per month per lamp and having less than 100 lamps pays 12 cents per kilowatt hour. This rate is reduced by gradations until for 3,000 lamps or over, with a 10-cent-per-lamp guarantee, the rate is 6 cents per kilowatt hour. For the 45-cent-per-lamp guarantee the customer with fewer than 100 lamps pays 10 cents per kilowatt hour, while the customer with 3,000 lamps pays 5.2 cents per kilowatt hour.

All these rates are subject to discounts based on hours' use and quantity. The discount made according to the equivalent daily hours' use of the entire connected load starts with a 6 per cent discount for a kilowatt-hour consumption equivalent to one hour's use per day of the connected load, and rises by gradations to 25 per cent discount for a kilowatt-hour consumption equivalent to eighteen hours per day of the connected load. There is, also, in addition to this, a discount based on the amount of the bill, which is from 5 per cent on bills of under \$10 to 56 per cent on bills of over \$9,000 per month.

The motor rates are graded on the same plan. For a 1-horsepower motor customer they vary from 10 cents per kilowatt hour on a guarantee of \$1 per month per horsepower to 5 cents per kilowatt hour on a guarantee of \$7.50 per month per horsepower. The rate also depends on horsepower connected. Under the guarantee of \$1 per month per horsepower the customer with over 500 horsepower gets a 5.5-cent rate. Under a guarantee of \$2 per month per horsepower the rate is 4.5 cents. The rates for heating and cooking circuits in residences are 12 cents per kilowatt hour on a minimum monthly guarantee of \$2, 11 cents on a \$3 guarantee, 10 cents on a \$4 guarantee, 9 cents on a \$5 guarantee, 8 cents on a \$7.50 guarantee, 7.5 cents on a \$10 guarantee, and 7 cents on a \$15 guarantee. On these cooking rates a discount is given according to the quantity of current consumed; on bills of \$5 or under 5 per cent is deducted, and this per cent increases by 1 for each \$1 of increase in the bills up to \$15, at which point the discount is 15 per cent. For bills of over \$25 the discount is 20 per cent.

In its annual report<sup>1</sup> for 1908 the Wisconsin commission said that it found the rates filed by the larger companies to be generally based on scientific considerations, but that those of the smaller companies partook of "every conceivable form and method of determination." Out of 119 companies reporting, 50 had no discriminatory rates, and 3 out of every 100 customers paid less than the schedule rates. The report went on to say: "Because a certain utility has more discriminations in effect than another does not mean in itself that it is following a vicious practice or is using unlawful methods. Most of the discriminations cited are remnants of a former period of unrestricted competition; others are the outgrowth of circumstances over which the utilities themselves have no control." In a recent address President Meyer of the commission said that the "sliding-scale arrangement is full of promise for the future," because "when the individual manager feels that with greater and keener application, with increased efficiency and economy, the rate of return on his investment will be increased, he is much more likely to aim toward efficiency and economy than he would if no such inducements were held out to him."

Both the Wisconsin and the New York commissions have sought to introduce a uniform classification of accounts for electric companies. Two sets of accounts are required in Wisconsin. In general, electric plants operating in cities of 10,000 inhabitants or over must keep at least the list of accounts prescribed in Class A, and all plants in cities of under 10,000 population must keep the accounts prescribed in Class B. Any changes or additions proposed by a company must be filed with the commission before the accounts

in question are opened. At a meeting of the Northwestern Electrical Association the classification was spoken of in terms of approval by Mr. C. M. Duffy, comptroller of the Milwaukee Electric Railway and Light Company and chairman of the accounting committee of the association, who said that he did not understand how anyone engaged in the electric-lighting business would be willing to conduct it and know less about its finances than would be required by the commission. The fundamental principle of the accounting system is that all the costs of generating current shall be kept distinct from the other expenses. In New York state, also, both the commissions have put into force rules and systems for uniform accounting.

In New York City one of the features of the rate work of the public-service commission of the first district has been to make a more general provision for "breakdown" service. It has placed the price of this service at \$30 per kilowatt of maximum demand, against which the real consumption is an offset at regular rates. In other words, the commission has recognized the inherent propriety of a stand-by readiness-to-serve charge. The commission of the first district made an exhaustive investigation of the contracts made by the companies, revealing a negligible number of special contracts—one or two hundred in scores of thousands—and many of these, as in other businesses, left over from a former management or other control. One of the acts of the commission has been to prohibit specifically any "undue or unreasonable preference" or advantage "to anybody, while no charge shall be made that is not in a filed schedule, nor shall any electrical corporation refund or remit in any manner or by any device any portion of the rates or charges so specified." It is obvious that the immediate effect of such a general policy is to compel companies to classify their customers more closely, so that all in any given group shall be treated alike. The fundamental fact is that very few cases are alike in all particulars. Even where like conditions exist, sometimes the parties in question can not be persuaded of it, and the companies have insisted on the impossibility of meeting the rules of the commission either as to publishing every little concession to a customer's wishes or as to strict conformity with all the terms prescribed for contracts. A brief on this point filed with the commission by the New York Edison Company pointed out that one of its most important forms of contracts was for supplying energy to large buildings by wholesale or in bulk. These contracts were largely the result of personal canvass and individual negotiation, and it was claimed that if the company was not permitted to modify the phrasing or minor details of such contracts to suit peculiar conditions its business would be seriously interfered with. The company stated that it did not seek to make special terms or give unusual privileges to particular customers, but simply to be permitted to

<sup>1</sup>Second Annual Report of the Railroad Commission of Wisconsin, 1908.

modify the contracts to suit different conditions. It desired only to extend to every customer any convenience or facility that the special conditions surrounding the service made practicable, provided that the peculiar features introduced into the contract did not modify the cost to the consumer, and provided that the company was prepared to extend the same privileges to all others who presented the same conditions. The company expressed itself as quite willing to accept and obey the order of the commission in so far as it prohibited any variation in charge, preference in rates, refunds, or special privileges, but it believed that special riders to the contracts with customers should be permitted to meet special conditions that did not affect the actual cost of furnishing the current, and it did not mean to discriminate in any way in favor of one customer as against another.

A valuable study of the whole subject of rates for electric energy is found in the decision of the Board of Gas and Electric Light Commissioners of Massachu-

setts in the matter of the complaint of the Public Franchise League against the Edison Electric Illuminating Company of Boston, filed May 29, 1908. In the opinion many of the points already discussed in this report, and others raised in the controversy, are given careful consideration. The Edison Electric Illuminating Company of Boston, like many other companies, has had a system of rates based upon "fixed costs" and "running costs," so as to charge each customer substantially the cost to it of supplying him, inclusive of a reasonable return on the investment—the basic method being known as the "maximum-demand" system. One of the various modifications of this system in use in America is the Doherty system, in operation in Denver and other cities. It is based fundamentally on the readiness-to-serve principle and aims at a more or less exact adjustment of the price to the consumer to the cost of producing that for which he contracts, and diverges widely from the idea of a uniform rate for all customers.



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# GENERAL TABLES

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(125)

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 117.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—

|    | STATE OR TERRITORY.         | Census | Number of stations. | Cost of construction and equipment. | INCOME.       |                   |               |                    |              |                    | EXPENSES.     |                     |
|----|-----------------------------|--------|---------------------|-------------------------------------|---------------|-------------------|---------------|--------------------|--------------|--------------------|---------------|---------------------|
|    |                             |        |                     |                                     | Gross income. | Electric service. |               |                    |              | All other sources. | Total.        | Salaries and wages. |
|    |                             |        |                     |                                     |               | Total.            | Lighting.     | Stationary motors. | All other.   |                    |               |                     |
| 1  | United States.....          | 1907   | 4,714               | \$1,096,913,622                     | \$175,642,338 | \$169,614,691     | \$125,755,114 | \$28,511,550       | \$15,348,027 | \$6,027,647        | \$106,205,149 | \$35,420,324        |
| 2  |                             | 1902   | 3,620               | 504,740,352                         | 85,700,605    | *84,186,605       | 70,138,147    | 9,910,217          | 4,138,241    | 1,514,000          | 55,457,830    | 20,646,692          |
| 3  | Alabama.....                | 1907   | 55                  | 7,293,876                           | 1,012,743     | 997,506           | 827,094       | 84,805             | 85,607       | 15,237             | 650,231       | 208,533             |
| 4  |                             | 1902   | 25                  | 908,895                             | 385,263       | 374,138           | 330,756       | 30,175             | 13,207       | 11,125             | 243,069       | 87,049              |
| 5  | Arizona.....                | 1907   | 15                  | 1,672,589                           | 569,850       | 544,192           | 446,962       | 71,806             | 25,422       | 25,658             | 414,347       | 130,663             |
| 6  |                             | 1902   | 13                  | 810,341                             | 293,066       | 288,019           | 243,239       | 44,780             | .....        | 5,047              | 222,063       | 82,644              |
| 7  | Arkansas.....               | 1907   | 63                  | 1,922,658                           | 675,718       | 664,916           | 620,306       | 18,248             | 26,362       | 10,802             | 443,735       | 157,814             |
| 8  |                             | 1902   | 42                  | 1,082,505                           | 425,317       | 413,775           | 383,113       | 23,214             | 7,448        | 11,542             | 256,177       | 90,759              |
| 9  | California.....             | 1907   | 129                 | 111,780,551                         | 14,416,529    | 13,922,028        | 8,111,012     | 3,826,462          | 1,984,554    | 494,501            | 8,357,184     | 3,094,193           |
| 10 |                             | 1902   | 115                 | 36,547,474                          | 5,066,417     | 4,946,090         | 3,305,318     | 1,228,099          | 412,673      | 120,327            | 3,219,422     | 1,176,741           |
| 11 | Colorado.....               | 1907   | 56                  | 23,128,179                          | 3,410,240     | 3,317,844         | 2,181,310     | 951,836            | 184,698      | 92,396             | 2,150,135     | 775,045             |
| 12 |                             | 1902   | 48                  | 8,665,826                           | 1,652,505     | 1,628,953         | 1,209,760     | 343,559            | 75,634       | 23,552             | 1,282,246     | 482,588             |
| 13 | Connecticut.....            | 1907   | 41                  | 13,416,011                          | 2,469,543     | 2,452,359         | 1,872,933     | 407,577            | 171,849      | 17,184             | 1,422,717     | 529,652             |
| 14 |                             | 1902   | 38                  | 6,583,477                           | 1,319,549     | 1,317,512         | 1,113,754     | 155,732            | 48,026       | 2,037              | 840,755       | 329,763             |
| 15 | Delaware <sup>1</sup> ..... | 1907   | 14                  | 12,735,909                          | 1,464,644     | 1,442,388         | 1,185,043     | 191,609            | 65,736       | 22,256             | 874,901       | 262,698             |
| 16 |                             | 1902   | 10                  | 4,667,770                           | 749,841       | 742,080           | 562,729       | 79,133             | 100,218      | 7,761              | 570,772       | 121,711             |
| 17 | Florida.....                | 1907   | 37                  | 1,630,061                           | 654,251       | 630,632           | 607,492       | 16,220             | 6,920        | 23,619             | 433,230       | 156,700             |
| 18 |                             | 1902   | 26                  | 974,425                             | 324,770       | 323,414           | 308,476       | 7,378              | 7,560        | 1,356              | 207,807       | 73,315              |
| 19 | Georgia.....                | 1907   | 93                  | 7,354,286                           | 1,110,510     | 1,066,601         | 731,852       | 132,964            | 221,785      | 23,909             | 612,975       | 232,711             |
| 20 |                             | 1902   | 43                  | 1,252,578                           | 357,565       | 348,753           | 311,603       | 35,350             | 1,800        | 8,812              | 235,038       | 92,173              |
| 21 | Idaho.....                  | 1907   | 42                  | 3,251,460                           | 719,395       | 692,489           | 546,309       | 100,291            | 45,889       | 26,906             | 415,579       | 171,125             |
| 22 |                             | 1902   | 19                  | 785,030                             | 192,206       | 191,126           | 185,535       | 5,591              | .....        | 1,080              | 127,510       | 66,719              |
| 23 | Illinois.....               | 1907   | 383                 | 88,142,233                          | 15,465,993    | 14,566,772        | 10,278,668    | 2,445,280          | 1,842,824    | 899,221            | 8,252,762     | 3,032,721           |
| 24 |                             | 1902   | 346                 | 38,329,275                          | 6,757,015     | 6,692,248         | 5,849,351     | 763,764            | 79,133       | 64,767             | 4,204,046     | 1,603,904           |
| 25 | Indiana.....                | 1907   | 200                 | 25,680,710                          | 4,438,332     | 4,222,610         | 3,457,753     | 568,199            | 196,658      | 215,722            | 2,895,729     | 969,263             |
| 26 |                             | 1902   | 180                 | 6,706,510                           | 2,106,146     | 2,038,121         | 1,916,135     | 120,435            | 1,551        | 67,025             | 1,442,115     | 549,428             |
| 27 | Iowa.....                   | 1907   | 192                 | 9,986,666                           | 2,479,969     | 2,317,880         | 2,015,394     | 261,202            | 41,284       | 162,089            | 1,701,173     | 547,177             |
| 28 |                             | 1902   | 169                 | 8,554,234                           | 1,545,663     | 1,477,348         | 1,389,644     | 78,180             | 9,524        | 68,315             | 1,091,943     | 406,819             |
| 29 | Kansas.....                 | 1907   | 111                 | 6,589,805                           | 1,514,867     | 1,419,091         | 1,092,153     | 224,224            | 102,714      | 95,776             | 1,031,312     | 374,496             |
| 30 |                             | 1902   | 61                  | 2,023,886                           | 650,833       | 611,986           | 563,403       | 48,558             | 5            | 38,867             | 455,235       | 167,762             |
| 31 | Kentucky.....               | 1907   | 83                  | 10,356,088                          | 1,660,700     | 1,610,475         | 1,371,567     | 220,061            | 18,847       | 50,225             | 1,010,338     | 301,794             |
| 32 |                             | 1902   | 58                  | 3,670,152                           | 850,086       | 848,399           | 740,678       | 92,401             | 15,120       | 1,687              | 636,854       | 216,438             |
| 33 | Louisiana.....              | 1907   | 42                  | 11,614,121                          | 1,852,383     | 1,829,128         | 1,573,879     | 228,680            | 26,569       | 23,255             | 1,189,726     | 382,982             |
| 34 |                             | 1902   | 25                  | 6,066,603                           | 971,631       | 967,027           | 850,471       | 116,556            | .....        | 4,604              | 532,776       | 226,050             |
| 35 | Maine.....                  | 1907   | 81                  | 12,629,101                          | 1,453,016     | 1,324,648         | 970,243       | 284,627            | 69,778       | 128,368            | 866,807       | 308,006             |
| 36 |                             | 1902   | 52                  | 4,824,850                           | 692,350       | 668,575           | 574,718       | 92,032             | 1,825        | 23,775             | 479,850       | 202,726             |
| 37 | Maryland.....               | 1907   | 36                  | 21,274,959                          | 1,883,084     | 1,856,359         | 1,496,286     | 349,059            | 9,014        | 26,725             | 1,517,770     | 496,810             |
| 38 |                             | 1902   | 32                  | 7,157,966                           | 962,207       | 951,816           | 854,798       | 91,437             | 5,061        | 10,891             | 604,376       | 204,888             |
| 39 | Massachusetts.....          | 1907   | 120                 | 43,279,226                          | 10,749,240    | 10,602,498        | 8,543,327     | 1,519,708          | 539,463      | 146,742            | 6,809,793     | 2,235,647           |
| 40 |                             | 1902   | 114                 | 29,562,267                          | 6,340,944     | 6,244,882         | 5,263,113     | 744,879            | 236,890      | 96,062             | 4,428,961     | 1,588,836           |
| 41 | Michigan.....               | 1907   | 234                 | 37,001,060                          | 6,072,010     | 5,750,447         | 3,848,797     | 873,061            | 1,028,569    | 321,563            | 3,754,215     | 1,126,813           |
| 42 |                             | 1902   | 201                 | 11,559,169                          | 2,613,812     | 2,516,800         | 2,285,995     | 173,881            | 56,924       | 97,012             | 1,743,218     | 728,952             |
| 43 | Minnesota.....              | 1907   | 171                 | 24,138,061                          | 3,478,009     | 3,333,469         | 2,700,959     | 536,622            | 95,888       | 144,540            | 2,259,919     | 755,778             |
| 44 |                             | 1902   | 138                 | 9,236,505                           | 1,858,789     | 1,838,806         | 1,615,766     | 191,432            | 31,608       | 19,983             | 1,230,928     | 433,256             |
| 45 | Mississippi.....            | 1907   | 68                  | 2,220,662                           | 686,700       | 667,543           | 621,959       | 26,133             | 19,451       | 19,157             | 441,281       | 161,433             |
| 46 |                             | 1902   | 43                  | 899,477                             | 366,934       | 341,546           | 319,393       | 18,741             | 3,412        | 25,388             | 263,459       | 95,300              |
| 47 | Missouri.....               | 1907   | 162                 | 33,865,760                          | 5,805,828     | 5,683,795         | 4,116,409     | 985,596            | 581,790      | 122,033            | 3,754,747     | 1,306,640           |
| 48 |                             | 1902   | 123                 | 15,679,872                          | 2,392,149     | 2,360,150         | 1,954,562     | 402,937            | 2,651        | 31,999             | 1,695,316     | 684,197             |
| 49 | Montana.....                | 1907   | 33                  | 17,950,677                          | 2,469,131     | 2,376,472         | 1,150,342     | 963,669            | 262,461      | 92,659             | 1,102,955     | 360,768             |
| 50 |                             | 1902   | 27                  | 4,740,807                           | 1,025,971     | 1,017,805         | 697,488       | 32,881             | 287,436      | 8,166              | 547,696       | 218,302             |
| 51 | Nebraska.....               | 1907   | 98                  | 7,372,081                           | 1,562,669     | 1,474,426         | 1,232,411     | 168,402            | 73,613       | 88,243             | 968,713       | 313,427             |
| 52 |                             | 1902   | 54                  | 3,305,840                           | 601,777       | 597,304           | 542,317       | 54,812             | 175          | 4,473              | 376,418       | 149,190             |
| 53 | Nevada.....                 | 1907   | 9                   | 4,299,631                           | 372,108       | 352,959           | 194,525       | 148,560            | 9,874        | 19,149             | 198,491       | 77,284              |
| 54 |                             | 1902   | 5                   | 301,785                             | 44,549        | 44,549            | 44,399        | 150                | .....        | .....              | 31,887        | 14,776              |
| 55 | New Hampshire.....          | 1907   | 56                  | 8,695,652                           | 1,422,345     | 1,321,296         | 825,315       | 190,764            | 305,217      | 101,049            | 704,964       | 286,749             |
| 56 |                             | 1902   | 51                  | 6,447,560                           | 832,322       | 826,176           | 609,385       | 82,257             | 134,534      | 6,146              | 436,027       | 187,933             |
| 57 | New Jersey.....             | 1907   | 64                  | 65,219,445                          | 5,952,378     | 5,910,745         | 5,123,926     | 682,028            | 104,791      | 41,633             | 3,702,064     | 1,370,506           |
| 58 |                             | 1902   | 64                  | 56,432,502                          | 3,421,304     | 3,356,599         | 2,799,961     | 258,055            | 298,583      | 64,705             | 2,309,227     | 821,739             |
| 59 | New Mexico.....             | 1907   | 15                  | 989,317                             | 292,662       | 289,962           | 228,151       | 24,033             | 37,778       | 2,720              | 208,614       | 66,961              |
| 60 |                             | 1902   | 11                  | 369,877                             | 135,307       | 133,747           | 127,747       | 6,000              | .....        | 1,560              | 95,471        | 34,740              |
| 61 | New York.....               | 1907   | 314                 | 252,731,789                         | 34,859,170    | 34,067,383        | 24,296,438    | 5,688,401          | 4,062,544    | 791,787            | 19,528,187    | 5,819,617           |
| 62 |                             | 1902   | 256                 | 112,998,778                         | 16,854,839    | 16,742,239        | 12,920,807    | 2,396,046          | 1,425,386    | 112,600            | 10,494,276    | 3,904,706           |

<sup>1</sup> Exclusive of 7,062 arc and 267,997 incandescent lamps used by the establishments reporting to light their own electric properties.<sup>2</sup> Includes estimated income of municipal stations from public lighting.

## GENERAL TABLES.

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## COMPARATIVE SUMMARY, BY STATES AND TERRITORIES: 1907 AND 1902.

| EXPENSES—continued.             |                            |                                                            | Horsepower of engines and water wheels (including auxiliary engines). | Kilowatt capacity of dynamos. | Output of stations, kilowatt hours. | NUMBER OF LAMPS. <sup>1</sup> |                          |                                                    | EMPLOYEES.                     |                           |                  |                            |          |
|---------------------------------|----------------------------|------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------|-------------------------------------|-------------------------------|--------------------------|----------------------------------------------------|--------------------------------|---------------------------|------------------|----------------------------|----------|
| Cost of supplies and materials. | Cost of fuel.              | Rents, taxes, insurance, and other miscellaneous expenses. |                                                                       |                               |                                     | Arc.                          | Incandescent.            | All other (including Nernst, vacuum, vapor, etc.). | Salaried officials and clerks. |                           | Wage-earners.    |                            |          |
|                                 |                            |                                                            |                                                                       |                               |                                     |                               |                          |                                                    | Number.                        | Salaries.                 | Average number.  | Wages.                     |          |
| \$21,400,823<br>11,280,423      | \$23,057,745<br>11,635,509 | \$26,326,257<br>11,895,206                                 | 4,098,188<br>1,845,048                                                | 2,709,225<br>1,212,235        | 5,862,276,737<br>2,507,061,115      | 555,713<br>385,698            | 41,445,997<br>18,194,044 | 162,338                                            | 12,990<br>6,996                | \$11,733,787<br>5,663,680 | 34,642<br>23,330 | \$23,686,537<br>14,983,112 | 1<br>2   |
| 87,032<br>50,731                | 216,013<br>62,243          | 138,653<br>43,036                                          | 26,404<br>7,620                                                       | 17,124<br>4,473               | 30,846,764<br>11,616,707            | 4,926<br>2,033                | 232,577<br>61,373        | 69                                                 | 109<br>41                      | 82,498<br>31,637          | 234<br>121       | 126,035<br>55,412          | 3<br>4   |
| 52,989<br>30,324                | 178,232<br>86,465          | 52,463<br>22,620                                           | 7,746<br>2,540                                                        | 4,939<br>1,811                | 9,392,302<br>3,662,045              | 754<br>295                    | 72,001<br>36,556         | 27                                                 | 58<br>28                       | 55,596<br>30,545          | 90<br>58         | 75,067<br>52,099           | 5<br>6   |
| 58,799<br>63,592                | 169,967<br>66,294          | 57,155<br>35,532                                           | 13,953<br>8,433                                                       | 9,678<br>6,024                | 11,519,316<br>9,965,997             | 1,669<br>1,654                | 142,446<br>82,234        | 79                                                 | 75<br>36                       | 52,670<br>27,354          | 169<br>113       | 105,144<br>63,405          | 7<br>8   |
| 1,940,030<br>803,390            | 1,122,639<br>562,742       | 2,200,322<br>676,549                                       | 384,673<br>134,788                                                    | 238,480<br>83,816             | 661,606,309<br>152,728,042          | 19,691<br>15,764              | 3,067,383<br>1,006,875   | 831                                                | 927<br>351                     | 1,141,902<br>395,587      | 2,201<br>1,009   | 1,952,291<br>781,154       | 9<br>10  |
| 333,516<br>280,822              | 486,033<br>227,201         | 552,541<br>291,635                                         | 82,427<br>38,268                                                      | 53,130<br>21,808              | 123,275,212<br>60,177,084           | 5,391<br>4,770                | 648,446<br>295,605       | 1,048                                              | 220<br>155                     | 220,340<br>141,885        | 698<br>433       | 554,705<br>340,703         | 11<br>12 |
| 247,029<br>209,125              | 334,733<br>178,099         | 311,303<br>123,768                                         | 56,243<br>28,389                                                      | 39,363<br>15,516              | 67,406,232<br>26,738,121            | 7,639<br>6,399                | 576,661<br>271,805       | 10,226                                             | 170<br>104                     | 166,759<br>106,807        | 575<br>395       | 362,893<br>222,956         | 13<br>14 |
| 196,534<br>165,897              | 155,299<br>116,079         | 260,370<br>167,065                                         | 33,806<br>10,123                                                      | 26,733<br>8,432               | 30,543,522<br>17,871,872            | 4,473<br>3,144                | 412,948<br>157,671       | 3,282                                              | 96<br>45                       | 84,244<br>34,729          | 258<br>163       | 178,454<br>86,982          | 15<br>16 |
| 54,036<br>24,983                | 187,324<br>92,393          | 35,170<br>17,116                                           | 14,370<br>6,114                                                       | 7,804<br>4,699                | 11,765,994<br>8,066,078             | 1,408<br>1,106                | 141,258<br>61,144        | 26                                                 | 71<br>30                       | 47,064<br>18,044          | 194<br>106       | 109,636<br>55,271          | 17<br>18 |
| 106,757<br>62,073               | 166,641<br>58,863          | 106,866<br>21,929                                          | 54,704<br>12,630                                                      | 35,446<br>7,620               | 59,311,202<br>9,911,243             | 3,173<br>1,452                | 179,913<br>60,139        | 424                                                | 132<br>56                      | 102,862<br>32,467         | 252<br>147       | 129,849<br>59,706          | 19<br>20 |
| 137,625<br>22,745               | 39,461<br>14,906           | 67,368<br>23,140                                           | 13,694<br>5,454                                                       | 7,062<br>2,774                | 9,577,588<br>5,018,149              | 966<br>557                    | 122,460<br>33,262        | 31                                                 | 72<br>23                       | 82,755<br>19,790          | 116<br>65        | 88,370<br>46,929           | 21<br>22 |
| 1,376,655<br>742,277            | 2,006,053<br>989,076       | 1,837,333<br>868,789                                       | 299,246<br>126,866                                                    | 209,226<br>100,320            | 467,657,328<br>161,543,646          | 55,309<br>38,215              | 3,582,178<br>1,567,665   | 9,131                                              | 1,034<br>580                   | 982,854<br>480,947        | 2,868<br>1,759   | 2,049,867<br>1,122,957     | 23<br>24 |
| 509,059<br>318,804              | 863,435<br>353,346         | 553,972<br>220,537                                         | 116,828<br>54,237                                                     | 81,576<br>38,144              | 130,263,693<br>75,585,493           | 22,165<br>15,325              | 1,325,182<br>656,451     | 5,478                                              | 448<br>243                     | 310,136<br>156,360        | 1,170<br>698     | 659,127<br>393,068         | 25<br>26 |
| 367,061<br>175,236              | 533,438<br>349,399         | 253,477<br>160,499                                         | 46,739<br>39,504                                                      | 32,066<br>24,886              | 37,729,072<br>36,506,425            | 7,352<br>5,929                | 806,451<br>420,847       | 935                                                | 278<br>196                     | 188,899<br>117,589        | 577<br>536       | 358,278<br>289,230         | 27<br>28 |
| 175,798<br>131,330              | 301,410<br>78,723          | 179,608<br>77,420                                          | 48,374<br>13,283                                                      | 30,307<br>8,596               | 59,740,179<br>13,326,518            | 5,685<br>3,498                | 471,876<br>128,857       | 875                                                | 182<br>78                      | 136,160<br>44,606         | 385<br>214       | 238,336<br>123,156         | 29<br>30 |
| 201,944<br>90,985               | 298,270<br>146,296         | 208,330<br>183,135                                         | 41,964<br>21,415                                                      | 29,140<br>15,012              | 37,232,623<br>27,835,614            | 6,884<br>4,598                | 483,401<br>142,602       | 395                                                | 124<br>75                      | 100,691<br>60,563         | 461<br>292       | 201,103<br>155,875         | 31<br>32 |
| 196,193<br>102,356              | 289,579<br>115,762         | 320,972<br>88,608                                          | 23,292<br>13,767                                                      | 15,175<br>7,781               | 26,421,316<br>17,474,261            | 8,587<br>4,278                | 376,990<br>135,593       | 235                                                | 113<br>78                      | 97,053<br>67,099          | 428<br>258       | 285,929<br>158,951         | 33<br>34 |
| 220,159<br>96,595               | 116,689<br>77,932          | 221,953<br>102,597                                         | 57,880<br>24,889                                                      | 39,290<br>15,291              | 66,136,651<br>21,987,700            | 3,187<br>2,254                | 442,940<br>204,632       | 252                                                | 157<br>88                      | 98,761<br>50,396          | 345<br>252       | 209,245<br>152,330         | 35<br>36 |
| 222,156<br>106,422              | 325,158<br>176,101         | 473,646<br>116,965                                         | 51,541<br>19,740                                                      | 36,223<br>13,207              | 47,868,675<br>22,128,125            | 9,292<br>5,761                | 634,705<br>125,087       | 4,844                                              | 160<br>83                      | 157,825<br>53,444         | 510<br>258       | 338,985<br>151,444         | 37<br>38 |
| 1,438,911<br>621,057            | 1,376,830<br>909,420       | 1,758,405<br>1,309,668                                     | 188,335<br>124,213                                                    | 135,924<br>90,624             | 219,425,607<br>125,813,392          | 33,899<br>28,790              | 2,650,724<br>1,420,963   | 4,579                                              | 655<br>459                     | 689,496<br>471,250        | 2,017<br>1,565   | 1,546,151<br>1,117,586     | 39<br>40 |
| 1,090,659<br>346,616            | 852,734<br>407,698         | 684,009<br>260,082                                         | 184,207<br>64,883                                                     | 101,714<br>44,176             | 208,154,199<br>80,564,630           | 23,514<br>17,712              | 1,711,689<br>806,127     | 5,650                                              | 554<br>313                     | 381,337<br>203,694        | 1,226<br>942     | 745,476<br>525,258         | 41<br>42 |
| 580,410<br>251,484              | 540,935<br>337,201         | 382,796<br>208,987                                         | 121,825<br>34,823                                                     | 78,516<br>20,999              | 87,579,431<br>40,258,632            | 13,398<br>8,543               | 900,119<br>384,705       | 2,904                                              | 292<br>175                     | 261,578<br>123,653        | 770<br>474       | 494,200<br>309,603         | 43<br>44 |
| 47,173<br>56,528                | 167,733<br>81,226          | 64,942<br>30,405                                           | 15,522<br>7,680                                                       | 9,884<br>5,106                | 15,704,624<br>9,825,926             | 1,694<br>1,035                | 141,027<br>85,111        | 52                                                 | 103<br>44                      | 71,213<br>29,422          | 185<br>138       | 90,220<br>66,878           | 45<br>46 |
| 717,251<br>305,558              | 767,710<br>427,166         | 963,146<br>278,396                                         | 111,416<br>45,318                                                     | 68,467<br>32,100              | 147,328,446<br>57,450,731           | 17,576<br>13,144              | 1,698,935<br>593,798     | 6,461                                              | 482<br>219                     | 447,578<br>185,715        | 1,318<br>778     | 859,062<br>498,482         | 47<br>48 |
| 300,818<br>110,459              | 122,551<br>95,241          | 318,818<br>123,684                                         | 68,817<br>31,887                                                      | 39,602<br>22,055              | 137,379,261<br>36,435,766           | 3,132<br>1,648                | 230,837<br>101,868       | 364                                                | 122<br>53                      | 175,087<br>73,308         | 197<br>149       | 185,681<br>144,994         | 49<br>50 |
| 168,144<br>78,331               | 307,992<br>82,598          | 179,150<br>66,299                                          | 30,020<br>12,308                                                      | 20,041<br>8,412               | 31,958,739<br>12,315,775            | 4,262<br>2,608                | 488,932<br>151,162       | 1,169                                              | 119<br>55                      | 104,250<br>42,801         | 285<br>182       | 209,177<br>106,389         | 51<br>52 |
| 50,600<br>11,460                | 15,867<br>2,260            | 54,760<br>3,391                                            | 6,980<br>1,720                                                        | 5,690<br>764                  | 29,621,730<br>1,508,910             | 327<br>78                     | 63,904<br>8,213          | 35                                                 | 23<br>7                        | 27,071<br>5,400           | 55<br>11         | 50,193<br>9,376            | 53<br>54 |
| 112,927<br>71,341               | 142,251<br>80,627          | 163,037<br>96,126                                          | 46,784<br>28,096                                                      | 31,917<br>17,777              | 55,258,921<br>27,377,793            | 3,510<br>2,879                | 301,300<br>170,541       | 434                                                | 109<br>77                      | 83,568<br>46,580          | 313<br>217       | 203,181<br>141,353         | 55<br>56 |
| 691,810<br>449,766              | 1,002,471<br>504,076       | 637,277<br>433,646                                         | 93,602<br>68,761                                                      | 70,566<br>46,120              | 140,527,522<br>78,739,456           | 21,973<br>15,685              | 1,673,062<br>646,762     | 1,939                                              | 399<br>258                     | 419,954<br>265,566        | 1,300<br>816     | 950,552<br>556,173         | 57<br>58 |
| 48,399<br>22,363                | 52,798<br>24,359           | 40,436<br>14,009                                           | 4,548<br>1,780                                                        | 3,793<br>986                  | 4,614,349<br>2,637,810              | 332<br>272                    | 55,229<br>22,507         | 150                                                | 27<br>12                       | 21,505<br>11,320          | 56<br>33         | 45,476<br>23,420           | 59<br>60 |
| 4,028,067<br>2,433,526          | 3,002,261<br>1,494,043     | 6,678,242<br>2,662,001                                     | 722,653<br>323,413                                                    | 482,031<br>187,252            | 1,452,222,471<br>701,799,716        | 97,529<br>59,130              | 6,991,406<br>3,705,525   | 25,655                                             | 1,879<br>897                   | 1,775,526<br>814,600      | 5,837<br>4,524   | 4,044,091<br>3,080,106     | 61<br>62 |

<sup>1</sup> Includes 2 stations in 1902 and 1 in 1907 in District of Columbia, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 117.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—

|     | STATE OR TERRITORY.      | Census.           | Number of stations. | Cost of construction and equipment. | INCOME.       |                   |            |                    |            |                    | EXPENSES. |                     |
|-----|--------------------------|-------------------|---------------------|-------------------------------------|---------------|-------------------|------------|--------------------|------------|--------------------|-----------|---------------------|
|     |                          |                   |                     |                                     | Gross income. | Electric service. |            |                    |            | All other sources. | Total.    | Salaries and wages. |
|     |                          |                   |                     |                                     |               | Total.            | Lighting.  | Stationary motors. | All other. |                    |           |                     |
| 63  | North Carolina.....      | 1907              | 71                  | \$2,241,791                         | \$543,322     | \$527,672         | \$425,856  | \$76,431           | \$25,385   | \$15,650           | \$370,375 | \$131,013           |
| 64  |                          | 1902              | 38                  | 803,936                             | 250,133       | 241,903           | 226,376    | 15,527             |            | 8,230              | 163,639   | 67,996              |
| 65  | North Dakota.....        | 1907              | 29                  | 1,619,997                           | 533,383       | 480,042           | 421,711    | 40,794             | 17,537     | 53,341             | 368,604   | 113,383             |
| 66  |                          | 1902              | 21                  | 416,843                             | 197,689       | 197,375           | 182,525    | 8,850              | 6,000      | 314                | 152,005   | 47,260              |
| 67  | Ohio.....                | 1907              | 272                 | 42,557,000                          | 7,643,997     | 7,474,980         | 6,282,861  | 1,054,076          | 138,043    | 169,017            | 5,336,848 | 1,543,925           |
| 68  |                          | 1902              | 233                 | 26,381,397                          | 4,431,038     | 4,347,506         | 3,873,339  | 407,901            | 66,266     | 83,532             | 2,944,706 | 1,053,991           |
| 69  | Oklahoma.....            | 1907              | 72                  | 7,130,864                           | 1,106,316     | 1,097,134         | 920,737    | 103,920            | 72,477     | 9,182              | 791,687   | 264,604             |
| 70  |                          | 1902 <sup>2</sup> | 20                  | 597,516                             | 281,452       | 267,453           | 254,627    | 12,826             |            | 13,999             | 166,039   | 61,929              |
| 71  | Oregon.....              | 1907              | 61                  | 14,403,278                          | 1,965,245     | 1,840,155         | 1,280,949  | 375,306            | 183,900    | 125,090            | 918,760   | 416,424             |
| 72  |                          | 1902              | 39                  | 5,157,651                           | 691,582       | 638,571           | 497,629    | 89,942             | 51,000     | 53,011             | 338,142   | 167,755             |
| 73  | Pennsylvania.....        | 1907              | 327                 | 73,907,749                          | 16,015,392    | 15,400,800        | 12,081,602 | 2,101,320          | 1,217,878  | 614,592            | 9,884,187 | 3,241,421           |
| 74  |                          | 1902              | 279                 | 41,579,338                          | 9,486,867     | 9,311,416         | 8,321,766  | 640,948            | 348,702    | 175,451            | 5,779,371 | 2,065,415           |
| 75  | Rhode Island.....        | 1907              | 7                   | 7,327,862                           | 1,724,659     | 1,627,190         | 1,257,521  | 302,513            | 67,156     | 97,469             | 990,845   | 350,605             |
| 76  |                          | 1902              | 7                   | 5,428,796                           | 1,026,407     | 965,595           | 816,773    | 120,935            | 47,887     | 40,812             | 763,414   | 238,724             |
| 77  | South Carolina.....      | 1907              | 40                  | 8,803,382                           | 901,537       | 865,708           | 409,665    | 432,384            | 23,659     | 35,829             | 511,486   | 145,357             |
| 78  |                          | 1902              | 24                  | 2,442,989                           | 387,010       | 356,066           | 180,973    | 169,353            | 5,740      | 30,944             | 213,439   | 75,642              |
| 79  | South Dakota.....        | 1907              | 37                  | 2,806,363                           | 513,682       | 492,767           | 379,963    | 110,651            | 2,153      | 20,915             | 359,086   | 127,143             |
| 80  |                          | 1902              | 28                  | 623,504                             | 207,868       | 204,292           | 199,254    | 5,038              |            | 3,576              | 151,471   | 58,116              |
| 81  | Tennessee.....           | 1907              | 78                  | 7,514,333                           | 1,299,963     | 1,266,610         | 1,063,323  | 130,796            | 72,489     | 33,373             | 736,964   | 247,764             |
| 82  |                          | 1902              | 54                  | 3,603,088                           | 912,482       | 911,555           | 716,417    | 134,023            | 61,115     | 927                | 480,171   | 165,041             |
| 83  | Texas.....               | 1907              | 218                 | 11,313,529                          | 3,792,203     | 3,668,722         | 3,066,994  | 376,897            | 224,831    | 123,481            | 2,900,888 | 789,219             |
| 84  |                          | 1902              | 137                 | 5,510,491                           | 2,074,558     | 2,049,225         | 1,753,681  | 203,859            | 91,685     | 25,333             | 1,435,016 | 509,181             |
| 85  | Utah.....                | 1907              | 31                  | 5,148,596                           | 665,241       | 627,332           | 249,472    | 173,439            | 204,421    | 37,909             | 353,108   | 159,686             |
| 86  |                          | 1902              | 16                  | 7,521,780                           | 714,853       | 664,240           | 435,426    | 156,381            | 72,463     | 50,113             | 452,814   | 177,391             |
| 87  | Vermont.....             | 1907              | 60                  | 7,234,498                           | 841,701       | 795,391           | 603,381    | 162,376            | 29,634     | 46,310             | 521,143   | 188,780             |
| 88  |                          | 1902              | 52                  | 2,691,170                           | 485,505       | 461,898           | 372,408    | 67,771             | 21,719     | 23,607             | 293,965   | 132,645             |
| 89  | Virginia.....            | 1907              | 51                  | 1,790,271                           | 390,628       | 380,779           | 319,902    | 40,746             | 20,131     | 9,849              | 238,205   | 99,060              |
| 90  |                          | 1902              | 37                  | 1,089,347                           | 210,632       | 210,176           | 202,135    | 8,041              |            | 456                | 160,440   | 68,249              |
| 91  | Washington.....          | 1907              | 71                  | 20,789,849                          | 3,410,542     | 3,219,814         | 2,078,156  | 531,818            | 609,840    | 190,728            | 1,911,691 | 800,441             |
| 92  |                          | 1902              | 40                  | 3,537,022                           | 783,651       | 739,743           | 586,274    | 66,866             | 86,603     | 43,908             | 566,667   | 218,177             |
| 93  | West Virginia.....       | 1907              | 48                  | 2,682,935                           | 724,253       | 689,919           | 567,027    | 43,084             | 79,808     | 34,334             | 479,011   | 168,633             |
| 94  |                          | 1902              | 41                  | 1,123,449                           | 322,015       | 320,443           | 307,166    | 7,509              | 5,768      | 1,572              | 225,860   | 95,343              |
| 95  | Wisconsin.....           | 1907              | 206                 | 10,478,355                          | 2,278,637     | 2,127,080         | 1,783,357  | 253,087            | 90,636     | 151,557            | 1,641,894 | 541,049             |
| 96  |                          | 1902              | 152                 | 4,678,316                           | 1,288,020     | 1,270,669         | 1,178,349  | 75,992             | 16,328     | 17,351             | 861,194   | 324,308             |
| 97  | Wyoming.....             | 1907              | 18                  | 942,326                             | 317,580       | 303,683           | 291,822    | 11,761             | 100        | 13,897             | 215,773   | 77,811              |
| 98  |                          | 1902              | 13                  | 467,463                             | 159,216       | 159,016           | 158,415    | 60                 | 541        | 200                | 104,549   | 46,125              |
| 99  | Alaska.....              | 1907              | 9                   | 626,837                             | 416,103       | 397,332           | 287,347    | 109,985            |            | 18,771             | 322,810   | 131,371             |
| 100 |                          | 1902 <sup>2</sup> | 4                   | 822,523                             | 336,005       | 207,800           | 183,595    | 24,005             |            | 128,405            | 261,984   | 89,154              |
| 101 | Hawaii and Porto Rico... | 1907 <sup>4</sup> | 6                   | 632,936                             | 321,592       | 307,774           | 269,455    | 32,295             | 6,024      | 13,818             | 208,401   | 85,509              |
| 102 |                          | 1902 <sup>5</sup> |                     |                                     |               |                   |            |                    |            |                    |           |                     |

<sup>1</sup> Exclusive of 7,062 arc and 267,997 incandescent lamps used by the establishments reporting to light their own electric properties.<sup>2</sup> Includes Indian Territory in 1902.<sup>3</sup> Includes 2 stations in Hawaii, in order that the operations of individual stations may not be disclosed.



## GENERAL TABLES.

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## COMPARATIVE SUMMARY, BY STATES AND TERRITORIES: 1907 AND 1902—Continued.

| EXPENSES—continued.             |                        |                                                            | Horsepower of engines and water wheels (including auxiliary engines). | Kilowatt capacity of dynamos. | Output of stations, kilowatt hours. | NUMBER OF LAMPS. <sup>1</sup> |                        |                                                    | EMPLOYEES.                     |                      |                 |                        |           |
|---------------------------------|------------------------|------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------|-------------------------------------|-------------------------------|------------------------|----------------------------------------------------|--------------------------------|----------------------|-----------------|------------------------|-----------|
| Cost of supplies and materials. | Cost of fuel.          | Rents, taxes, insurance, and other miscellaneous expenses. |                                                                       |                               |                                     | Arc.                          | Incandescent.          | All other (including Nernst, vacuum, vapor, etc.). | Salaried officials and clerks. |                      | Wage-earners.   |                        |           |
|                                 |                        |                                                            |                                                                       |                               |                                     |                               |                        |                                                    | Number.                        | Salaries.            | Average number. | Wages.                 |           |
| \$62,948<br>36,330              | \$134,064<br>43,275    | \$42,350<br>16,038                                         | 20,683<br>6,566                                                       | 13,911<br>4,141               | 13,171,681<br>8,351,346             | 1,936<br>1,178                | 144,159<br>45,181      | 97                                                 | 72<br>45                       | \$50,937<br>27,934   | 176<br>96       | \$80,076<br>40,062     | 63<br>64  |
| 33,186<br>18,567                | 182,404<br>66,505      | 39,631<br>19,673                                           | 10,277<br>3,930                                                       | 5,819<br>2,042                | 8,229,765<br>5,850,115              | 1,163<br>502                  | 118,875<br>41,916      | 358                                                | 49<br>25                       | 43,205<br>16,470     | 101<br>50       | 70,178<br>30,790       | 65<br>66  |
| 899,760<br>564,844              | 1,307,873<br>704,104   | 1,615,290<br>621,767                                       | 179,111<br>103,745                                                    | 126,533<br>69,811             | 217,311,924<br>127,437,383          | 43,849<br>31,839              | 2,254,467<br>934,213   | 13,491                                             | 600<br>465                     | 517,401<br>263,190   | 1,497<br>1,301  | 1,026,524<br>790,801   | 67<br>68  |
| 71,885<br>23,559                | 288,253<br>63,958      | 166,945<br>16,593                                          | 22,623<br>4,407                                                       | 15,499<br>3,019               | 24,985,903<br>3,825,763             | 3,451<br>914                  | 218,884<br>37,443      | 653                                                | 126<br>21                      | 92,329<br>19,280     | 288<br>71       | 172,275<br>42,649      | 69<br>70  |
| 130,883<br>36,176               | 173,588<br>63,158      | 197,865<br>71,063                                          | 126,815<br>17,798                                                     | 32,587<br>11,165              | 92,807,992<br>17,531,660            | 3,927<br>2,023                | 370,092<br>95,045      | 2,752                                              | 118<br>46                      | 130,792<br>61,340    | 349<br>141      | 285,632<br>106,415     | 71<br>72  |
| 2,334,458<br>1,092,274          | 1,975,553<br>1,261,144 | 2,332,755<br>1,330,538                                     | 302,537<br>175,510                                                    | 212,543<br>121,388            | 416,554,167<br>241,094,328          | 66,777<br>47,722              | 3,861,171<br>1,783,683 | 36,491                                             | 1,189<br>713                   | 1,064,939<br>535,721 | 3,313<br>2,467  | 2,186,482<br>1,559,694 | 73<br>74  |
| 165,642<br>160,311              | 245,386<br>145,607     | 229,212<br>218,772                                         | 27,986<br>17,600                                                      | 21,040<br>12,139              | 35,651,323<br>23,436,435            | 5,970<br>5,161                | 384,597<br>196,188     | 732                                                | 73<br>38                       | 102,077<br>71,494    | 377<br>236      | 248,528<br>167,230     | 75<br>76  |
| 94,301<br>65,530                | 104,043<br>44,922      | 167,785<br>27,345                                          | 84,115<br>21,205                                                      | 51,271<br>13,390              | 68,696,424<br>18,426,763            | 2,521<br>1,366                | 149,907<br>46,068      | 111                                                | 93<br>40                       | 67,958<br>26,479     | 168<br>120      | 77,399<br>49,163       | 77<br>78  |
| 58,844<br>37,645                | 140,739<br>37,611      | 32,360<br>18,099                                           | 12,984<br>5,057                                                       | 10,046<br>2,910               | 13,615,015<br>4,256,007             | 1,278<br>798                  | 129,486<br>63,248      | 157                                                | 56<br>22                       | 55,710<br>18,068     | 113<br>63       | 71,433<br>40,048       | 79<br>80  |
| 106,251<br>99,097               | 225,985<br>123,655     | 154,964<br>92,378                                          | 28,730<br>19,003                                                      | 20,911<br>14,736              | 34,847,956<br>24,472,632            | 4,407<br>3,662                | 306,818<br>174,291     | 85                                                 | 121<br>65                      | 93,558<br>48,987     | 295<br>241      | 154,206<br>116,054     | 81<br>82  |
| 361,135<br>325,305              | 1,178,812<br>337,730   | 571,722<br>262,800                                         | 71,914<br>34,887                                                      | 48,558<br>26,108              | 75,829,108<br>48,888,450            | 8,176<br>5,146                | 794,972<br>303,591     | 9,351                                              | 378<br>173                     | 278,797<br>127,747   | 897<br>600      | 510,422<br>381,434     | 83<br>84  |
| 113,974<br>103,839              | 7,616<br>52,883        | 71,832<br>118,701                                          | 35,950<br>20,460                                                      | 33,592<br>13,923              | 61,672,661<br>32,457,063            | 440<br>1,469                  | 67,663<br>92,165       | 7                                                  | 61<br>69                       | 55,356<br>57,543     | 137<br>171      | 104,330<br>119,848     | 85<br>86  |
| 118,071<br>65,221               | 59,895<br>42,251       | 154,397<br>53,848                                          | 38,566<br>23,857                                                      | 21,854<br>11,442              | 29,923,333<br>22,374,060            | 1,866<br>1,534                | 305,593<br>161,106     | 652                                                | 109<br>89                      | 69,006<br>39,595     | 188<br>153      | 119,774<br>93,050      | 87<br>88  |
| 54,188<br>30,947                | 51,370<br>38,329       | 33,587<br>22,915                                           | 14,619<br>5,443                                                       | 9,195<br>3,827                | 10,208,360<br>6,879,243             | 1,415<br>1,278                | 93,035<br>37,645       | 600                                                | 66<br>63                       | 38,207<br>22,071     | 112<br>107      | 60,853<br>46,178       | 89<br>90  |
| 575,637<br>194,938              | 161,085<br>55,974      | 374,528<br>97,578                                          | 67,224<br>22,894                                                      | 66,308<br>13,679              | 257,785,236<br>19,722,262           | 6,771<br>2,977                | 618,807<br>108,443     | 6,056                                              | 221<br>75                      | 247,647<br>68,365    | 664<br>199      | 552,794<br>149,812     | 91<br>92  |
| 129,417<br>43,748               | 113,140<br>57,909      | 67,815<br>28,860                                           | 21,428<br>10,820                                                      | 14,726<br>6,985               | 24,871,317<br>11,355,905            | 2,885<br>1,898                | 159,800<br>78,066      | 479                                                | 83<br>44                       | 49,785<br>19,080     | 179<br>124      | 118,848<br>76,313      | 93<br>94  |
| 334,984<br>132,964              | 484,169<br>271,642     | 281,692<br>132,280                                         | 58,889<br>35,715                                                      | 40,711<br>23,118              | 52,546,210<br>29,966,758            | 8,697<br>7,416                | 779,354<br>428,930     | 2,327                                              | 290<br>131                     | 190,129<br>85,158    | 577<br>434      | 350,920<br>239,150     | 95<br>96  |
| 24,698<br>12,952                | 78,257<br>27,147       | 35,007<br>18,325                                           | 5,125<br>3,229                                                        | 3,208<br>1,831                | 5,499,084<br>3,883,285              | 517<br>259                    | 59,315<br>22,062       | 359                                                | 35<br>13                       | 28,722<br>11,950     | 61<br>40        | 49,089<br>34,175       | 97<br>98  |
| 47,251<br>61,247                | 114,996<br>66,971      | 29,192<br>44,612                                           | 4,741<br>3,583                                                        | 2,449<br>2,192                | 3,390,401<br>3,430,600              | 67<br>152                     | 19,818<br>33,877       | 20                                                 | 27<br>26                       | 52,350<br>25,387     | 49<br>75        | 79,021<br>63,767       | 99<br>100 |
| 22,992                          | 58,718                 | 41,182                                                     | 4,416                                                                 | 2,562                         | 5,049,047                           | 539                           | 58,492                 | 12                                                 | 30                             | 32,091               | 80              | 53,418                 | 101       |
|                                 |                        |                                                            |                                                                       |                               |                                     |                               |                        |                                                    |                                |                      |                 |                        | 102       |

<sup>1</sup>Includes 2 stations in Hawaii and 4 in Porto Rico, in order that the operations of individual stations may not be disclosed.  
<sup>2</sup>Hawaii included with Alaska, and Porto Rico not reported.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 118.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY

| 1  | STATE OR TERRITORY          | Num-<br>ber of<br>sta-<br>tions. | PRIMARY POWER. |                  |                |           |                         |                  |                                         |                  |                                      |                  |                                      |                  |                          |                  |
|----|-----------------------------|----------------------------------|----------------|------------------|----------------|-----------|-------------------------|------------------|-----------------------------------------|------------------|--------------------------------------|------------------|--------------------------------------|------------------|--------------------------|------------------|
|    |                             |                                  | Aggregate.     |                  | Steam engines. |           |                         |                  |                                         |                  |                                      |                  |                                      |                  |                          |                  |
|    |                             |                                  |                |                  | Total.         |           | 500 H. P. and<br>under. |                  | Over 500 H. P. but<br>under 1,000 H. P. |                  | 1,000 H. P. but<br>under 2,000 H. P. |                  | 2,000 H. P. but<br>under 5,000 H. P. |                  | 5,000 H. P. and<br>over. |                  |
|    |                             |                                  | Num-<br>ber.   | Horse-<br>power. |                |           | Num-<br>ber.            | Horse-<br>power. | Num-<br>ber.                            | Horse-<br>power. | Num-<br>ber.                         | Horse-<br>power. | Num-<br>ber.                         | Horse-<br>power. | Num-<br>ber.             | Horse-<br>power. |
| 1  | United States...            | 4,714                            | 10,998         | 4,098,188        | 6,829          | 1,810,040 | 6,183                   | 1,018,566        | 375                                     | 259,478          | 182                                  | 230,216          | 70                                   | 186,280          | 19                       | 115,500          |
| 2  | Alabama.....                | 55                               | 100            | 26,404           | 76             | 16,835    | 69                      | 10,505           | 4                                       | 2,430            | 3                                    | 3,900            |                                      |                  |                          |                  |
| 3  | Arizona.....                | 15                               | 39             | 7,746            | 25             | 4,286     | 25                      | 4,286            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 4  | Arkansas.....               | 63                               | 100            | 13,953           | 89             | 12,091    | 89                      | 12,091           |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 5  | California.....             | 129                              | 384            | 384,673          | 143            | 98,299    | 107                     | 23,469           | 15                                      | 10,405           | 5                                    | 6,025            | 11                                   | 23,900           | 5                        | 34,500           |
| 6  | Colorado.....               | 56                               | 192            | 82,427           | 97             | 32,835    | 75                      | 11,952           | 13                                      | 9,883            | 7                                    | 7,000            |                                      | 4,000            |                          |                  |
| 7  | Connecticut.....            | 41                               | 183            | 56,243           | 99             | 24,357    | 94                      | 20,557           | 5                                       | 3,800            |                                      |                  |                                      |                  |                          |                  |
| 8  | Delaware <sup>1</sup> ..... | 14                               | 55             | 33,805           | 29             | 8,515     | 24                      | 4,315            | 5                                       | 4,200            |                                      |                  |                                      |                  |                          |                  |
| 9  | Florida.....                | 37                               | 75             | 14,370           | 57             | 10,004    | 56                      | 9,254            | 1                                       | 750              |                                      |                  |                                      |                  |                          |                  |
| 10 | Georgia.....                | 93                               | 142            | 54,704           | 102            | 16,129    | 101                     | 14,879           |                                         |                  | 1                                    | 1,250            |                                      |                  |                          |                  |
| 11 | Idaho.....                  | 42                               | 56             | 13,694           | 19             | 2,202     | 19                      | 2,202            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 12 | Illinois.....               | 383                              | 832            | 299,246          | 654            | 148,248   | 599                     | 85,898           | 30                                      | 21,950           | 21                                   | 26,400           | 3                                    | 9,000            | 1                        | 5,000            |
| 13 | Indiana.....                | 200                              | 479            | 116,828          | 324            | 68,311    | 305                     | 53,561           | 16                                      | 10,250           | 3                                    | 4,500            |                                      |                  |                          |                  |
| 14 | Iowa.....                   | 192                              | 339            | 46,739           | 266            | 40,406    | 258                     | 34,301           | 6                                       | 3,407            | 2                                    | 2,698            |                                      |                  |                          |                  |
| 15 | Kansas.....                 | 111                              | 222            | 48,374           | 146            | 35,589    | 138                     | 22,169           | 4                                       | 3,000            | 1                                    | 1,420            | 3                                    | 9,000            |                          |                  |
| 16 | Kentucky.....               | 83                               | 158            | 41,984           | 144            | 32,539    | 127                     | 19,439           | 13                                      | 8,300            | 4                                    | 4,800            |                                      |                  |                          |                  |
| 17 | Louisiana.....              | 42                               | 89             | 23,292           | 69             | 20,542    | 59                      | 8,667            | 4                                       | 2,875            | 4                                    | 5,000            | 2                                    | 4,000            |                          |                  |
| 18 | Maine.....                  | 81                               | 215            | 57,680           | 74             | 16,293    | 73                      | 15,693           | 1                                       | 600              |                                      |                  |                                      |                  |                          |                  |
| 19 | Maryland.....               | 36                               | 116            | 51,541           | 81             | 39,035    | 71                      | 12,885           | 4                                       | 2,650            | 1                                    | 1,000            | 4                                    | 15,000           | 1                        | 7,500            |
| 20 | Massachusetts.....          | 120                              | 393            | 188,335          | 285            | 118,287   | 222                     | 46,881           | 40                                      | 28,756           | 12                                   | 15,400           | 11                                   | 27,250           |                          |                  |
| 21 | Michigan.....               | 234                              | 583            | 184,207          | 280            | 56,893    | 264                     | 44,060           | 13                                      | 9,100            | 3                                    | 3,733            |                                      |                  |                          |                  |
| 22 | Minnesota.....              | 171                              | 343            | 121,825          | 220            | 39,895    | 207                     | 27,545           | 8                                       | 5,200            | 4                                    | 5,150            | 1                                    | 2,000            |                          |                  |
| 23 | Mississippi.....            | 68                               | 107            | 15,522           | 95             | 14,072    | 95                      | 14,072           |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 24 | Missouri.....               | 162                              | 380            | 111,416          | 226            | 63,162    | 205                     | 30,972           | 8                                       | 5,430            | 6                                    | 6,630            | 7                                    | 20,130           |                          |                  |
| 25 | Montana.....                | 38                               | 93             | 68,817           | 28             | 5,805     | 26                      | 3,805            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 26 | Nebraska.....               | 98                               | 171            | 30,020           | 111            | 16,496    | 109                     | 14,546           | 1                                       | 750              | 1                                    | 1,200            |                                      |                  |                          |                  |
| 27 | Nevada.....                 | 9                                | 19             | 6,980            | 3              | 210       | 3                       | 210              |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 28 | New Hampshire.....          | 56                               | 166            | 46,784           | 38             | 14,870    | 33                      | 7,170            | 1                                       | 700              | 3                                    | 4,000            | 1                                    | 3,000            |                          |                  |
| 29 | New Jersey.....             | 64                               | 257            | 93,902           | 184            | 76,095    | 131                     | 28,267           | 31                                      | 21,050           | 22                                   | 26,778           |                                      |                  |                          |                  |
| 30 | New Mexico.....             | 15                               | 32             | 4,548            | 26             | 4,035     | 25                      | 3,185            |                                         | 850              |                                      |                  |                                      |                  |                          |                  |
| 31 | New York.....               | 314                              | 958            | 722,653          | 468            | 206,412   | 397                     | 71,212           | 33                                      | 23,400           | 17                                   | 22,000           | 10                                   | 29,300           | 11                       | 60,500           |
| 32 | North Carolina.....         | 71                               | 113            | 20,683           | 73             | 10,241    | 72                      | 9,641            | 1                                       | 600              |                                      |                  |                                      |                  |                          |                  |
| 33 | North Dakota.....           | 29                               | 61             | 10,277           | 55             | 9,820     | 54                      | 9,170            | 1                                       | 650              |                                      |                  |                                      |                  |                          |                  |
| 34 | Ohio.....                   | 272                              | 589            | 179,111          | 460            | 125,335   | 416                     | 67,276           | 22                                      | 13,977           | 12                                   | 16,882           | 10                                   | 27,200           |                          |                  |
| 35 | Oklahoma.....               | 72                               | 115            | 22,623           | 109            | 21,599    | 105                     | 18,159           | 3                                       | 1,940            | 1                                    | 1,500            |                                      |                  |                          |                  |
| 36 | Oregon.....                 | 61                               | 144            | 126,815          | 57             | 20,077    | 44                      | 7,877            | 6                                       | 3,800            | 7                                    | 8,400            |                                      |                  |                          |                  |
| 37 | Pennsylvania.....           | 327                              | 953            | 302,537          | 666            | 209,082   | 588                     | 123,557          | 45                                      | 30,925           | 29                                   | 38,600           | 3                                    | 8,000            | 1                        | 8,000            |
| 38 | Rhode Island.....           | 7                                | 66             | 27,986           | 22             | 12,480    | 11                      | 3,020            | 9                                       | 6,460            | 2                                    | 3,000            |                                      |                  |                          |                  |
| 39 | South Carolina.....         | 40                               | 104            | 84,115           | 48             | 8,475     | 47                      | 5,975            |                                         |                  |                                      |                  | 1                                    | 2,500            |                          |                  |
| 40 | South Dakota.....           | 37                               | 74             | 12,984           | 40             | 5,952     | 40                      | 5,952            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 41 | Tennessee.....              | 78                               | 142            | 28,730           | 110            | 21,150    | 103                     | 13,650           | 3                                       | 2,100            | 3                                    | 3,400            | 1                                    | 2,000            |                          |                  |
| 42 | Texas.....                  | 218                              | 415            | 71,914           | 287            | 49,216    | 268                     | 32,916           | 15                                      | 11,050           | 4                                    | 5,250            |                                      |                  |                          |                  |
| 43 | Utah.....                   | 31                               | 55             | 35,950           | 10             | 1,279     | 10                      | 1,279            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 44 | Vermont.....                | 60                               | 146            | 38,566           | 33             | 7,981     | 30                      | 6,131            | 3                                       | 1,850            |                                      |                  |                                      |                  |                          |                  |
| 45 | Virginia.....               | 51                               | 85             | 14,619           | 38             | 4,868     | 38                      | 4,868            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 46 | Washington.....             | 71                               | 114            | 67,224           | 49             | 9,514     | 46                      | 6,864            | 2                                       | 1,350            | 1                                    | 1,300            |                                      |                  |                          |                  |
| 47 | West Virginia.....          | 48                               | 95             | 21,428           | 65             | 13,811    | 61                      | 11,011           | 3                                       | 1,800            | 1                                    | 1,000            |                                      |                  |                          |                  |
| 48 | Wisconsin.....              | 206                              | 409            | 58,889           | 220            | 32,327    | 215                     | 29,087           | 5                                       | 3,240            |                                      |                  |                                      |                  |                          |                  |
| 49 | Wyoming.....                | 18                               | 40             | 5,125            | 29             | 4,085     | 29                      | 4,085            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 50 | Alaska.....                 | 9                                | 26             | 4,741            | 14             | 2,231     | 14                      | 2,231            |                                         |                  |                                      |                  |                                      |                  |                          |                  |
| 51 | Hawaii and Porto Rico       | 6                                | 22             | 4,416            | 13             | 3,190     | 13                      | 3,190            |                                         |                  |                                      |                  |                                      |                  |                          |                  |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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## POWER AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907.

| PRIMARY POWER—continued. |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              |    |
|--------------------------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-----------------------------------|--------------|-----------------------|---------------|----------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|----|
| Steam turbines.          |              |                      |              |                                      |              |                                   |              |                                   |              |                       | Water wheels. |          |              |                      |              |                                      |              |                                   |              |    |
| Total.                   |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              | 2,000 H. P. but under 5,000 H. P. |              | 5,000 H. P. and over. |               | Total.   |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              |    |
| Num-ber.                 | Horse-power. | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.              | Horse-power.  | Num-ber. | Horse-power. | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. |    |
| 377                      | 817,410      | 65                   | 17,017       | 123                                  | 85,680       | 67                                | 86,372       | 78                                | 221,415      | 44                    | 406,926       | 2,481    | 1,349,087    | 1,910                | 320,636      | 244                                  | 161,061      | 161                               | 196,620      | 1  |
| 4                        | 2,392        | 1                    | 225          | 3                                    | 2,167        |                                   |              |                                   |              |                       |               | 15       | 7,007        | 11                   | 1,007        |                                      |              | 4                                 | 6,000        | 2  |
| 5                        | 2,550        | 3                    | 1,000        | 2                                    | 1,550        |                                   |              |                                   |              |                       |               | 4        | 750          | 4                    | 750          |                                      |              |                                   |              | 3  |
| 2                        | 1,225        |                      |              | 2                                    | 1,225        |                                   |              |                                   |              |                       |               | 1        | 300          | 1                    | 300          |                                      |              |                                   |              | 4  |
| 13                       | 35,000       | 1                    | 390          | 2                                    | 1,500        | 2                                 | 2,500        | 6                                 | 16,610       | 2                     | 14,000        | 172      | 208,444      | 80                   | 17,519       | 18                                   | 14,225       | 35                                | 41,400       | 5  |
| 13                       | 22,166       | 1                    | 225          | 3                                    | 2,041        | 4                                 | 5,500        | 5                                 | 14,400       |                       |               | 47       | 25,580       | 32                   | 5,480        | 6                                    | 3,900        | 6                                 | 6,600        | 6  |
| 12                       | 12,886       | 3                    | 950          | 3                                    | 2,036        | 6                                 | 9,900        |                                   |              |                       |               | 54       | 18,045       | 48                   | 8,045        |                                      |              | 6                                 | 10,000       | 7  |
| 8                        | 23,800       | 2                    | 1,000        | 1                                    | 800          | 1                                 | 1,000        | 2                                 | 6,000        | 2                     | 15,000        | 5        | 285          | 5                    | 285          |                                      |              |                                   |              | 8  |
| 11                       | 4,200        | 8                    | 1,200        |                                      |              | 3                                 | 3,000        |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              | 9  |
| 1                        | 2,000        |                      |              |                                      |              |                                   |              | 1                                 | 2,000        |                       |               | 37       | 36,335       | 15                   | 2,335        | 4                                    | 3,000        | 11                                | 14,200       | 10 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 37       | 11,492       | 34                   | 8,742        | 1                                    | 750          | 2                                 | 2,000        | 11 |
| 27                       | 138,710      |                      |              | 10                                   | 6,710        | 4                                 | 5,300        | 3                                 | 10,200       | 10                    | 116,500       | 80       | 10,478       | 80                   | 10,478       |                                      |              |                                   |              | 12 |
| 25                       | 25,861       | 3                    | 187          | 13                                   | 9,324        | 4                                 | 4,650        | 5                                 | 11,700       |                       |               | 83       | 19,606       | 83                   | 19,606       |                                      |              |                                   |              | 13 |
| 2                        | 1,500        |                      |              | 2                                    | 1,500        |                                   |              |                                   |              |                       |               | 44       | 3,833        | 44                   | 3,833        |                                      |              |                                   |              | 14 |
| 2                        | 1,500        |                      |              | 2                                    | 1,500        |                                   |              |                                   |              |                       |               | 36       | 8,661        | 36                   | 8,661        |                                      |              |                                   |              | 15 |
| 3                        | 9,125        | 1                    | 125          |                                      |              |                                   |              | 2                                 | 9,000        |                       |               |          |              |                      |              |                                      |              |                                   |              | 16 |
| 2                        | 1,825        |                      |              | 1                                    | 525          | 1                                 | 1,300        |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              | 17 |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               | 132      | 39,766       | 103                  | 15,442       | 25                                   | 19,104       | 4                                 | 5,220        | 17 |
| 7                        | 10,866       | 2                    | 700          | 1                                    | 666          | 1                                 | 1,500        | 3                                 | 8,000        |                       |               | 13       | 1,347        | 13                   | 1,347        |                                      |              |                                   |              | 18 |
| 22                       | 51,330       | 2                    | 550          | 7                                    | 4,930        | 7                                 | 8,800        | 3                                 | 7,050        | 3                     | 30,000        | 58       | 16,781       | 49                   | 8,562        | 7                                    | 5,519        | 2                                 | 2,700        | 19 |
| 17                       | 40,215       | 2                    | 875          | 5                                    | 3,540        | 2                                 | 3,300        | 8                                 | 32,500       |                       |               | 249      | 85,738       | 174                  | 24,038       | 70                                   | 38,500       | 1                                 | 1,200        | 20 |
| 8                        | 8,200        | 4                    | 1,500        |                                      |              | 2                                 | 2,700        | 2                                 | 4,000        |                       |               | 71       | 71,656       | 57                   | 8,656        | 2                                    | 1,400        | 5                                 | 5,800        | 21 |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              | 22 |
| 3                        | 38,882       |                      |              | 2                                    | 1,342        |                                   |              | 4                                 | 10,720       | 4                     | 26,820        | 5        | 2,002        | 2                    | 202          | 3                                    | 1,800        |                                   |              | 23 |
| 10                       | 6,025        |                      |              | 1                                    | 625          |                                   |              | 2                                 | 5,400        |                       |               | 62       | 56,987       | 34                   | 6,432        | 5                                    | 4,125        | 15                                | 17,150       | 24 |
| 4                        | 8,750        |                      |              | 1                                    | 750          |                                   |              | 3                                 | 8,000        |                       |               | 19       | 2,954        | 18                   | 2,154        | 1                                    | 800          |                                   |              | 25 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 9        | 6,260        | 3                    | 310          | 5                                    | 3,750        |                                   |              | 26 |
| 6                        | 4,390        |                      |              | 6                                    | 4,390        |                                   |              | 1                                 | 4,000        |                       |               | 101      | 25,404       | 90                   | 14,604       | 3                                    | 2,400        | 8                                 | 8,500        | 27 |
| 10                       | 12,850       |                      |              | 2                                    | 1,500        | 7                                 | 7,350        |                                   |              |                       |               | 22       | 1,794        | 22                   | 1,794        |                                      |              |                                   |              | 28 |
| 47                       | 203,595      | 6                    | 1,270        | 8                                    | 5,072        | 4                                 | 5,160        | 12                                | 30,093       | 17                    | 162,000       | 6        | 513          | 6                    | 513          |                                      |              |                                   |              | 29 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 362      | 305,950      | 256                  | 44,468       | 32                                   | 20,782       | 25                                | 31,400       | 30 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 32       | 9,962        | 20                   | 3,012        | 12                                   | 6,950        |                                   |              | 31 |
| 20                       | 44,916       | 4                    | 1,250        | 6                                    | 4,500        | 4                                 | 5,166        | 3                                 | 11,500       | 3                     | 22,500        | 1        | 100          | 1                    | 100          |                                      |              |                                   |              | 32 |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               | 21       | 2,037        | 21                   | 2,037        |                                      |              |                                   |              | 33 |
| 2                        | 4,000        |                      |              |                                      |              |                                   |              | 2                                 | 4,000        |                       |               |          |              |                      |              |                                      |              |                                   |              | 34 |
| 39                       | 49,081       | 7                    | 1,675        | 21                                   | 14,345       | 5                                 | 6,433        | 3                                 | 6,522        | 3                     | 20,106        | 72       | 102,052      | 38                   | 6,286        | 6                                    | 4,266        | 3                                 | 3,000        | 35 |
| 6                        | 12,020       |                      |              |                                      |              | 2                                 | 2,300        | 4                                 | 9,720        |                       |               | 119      | 30,863       | 110                  | 23,083       | 4                                    | 2,780        | 5                                 | 5,000        | 36 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 16       | 2,263        | 16                   | 2,263        |                                      |              |                                   |              | 37 |
| 5                        | 4,100        | 3                    | 1,100        |                                      |              | 2                                 | 3,000        |                                   |              |                       |               | 52       | 75,430       | 21                   | 8,705        | 7                                    | 4,500        | 16                                | 20,625       | 38 |
| 6                        | 5,360        |                      |              | 4                                    | 2,680        | 2                                 | 2,680        |                                   |              |                       |               | 12       | 2,205        | 10                   | 1,005        | 2                                    | 1,200        |                                   |              | 39 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 14       | 1,240        | 14                   | 1,240        |                                      |              |                                   |              | 40 |
| 11                       | 15,186       | 3                    | 1,100        | 1                                    | 536          | 3                                 | 3,500        | 4                                 | 10,000       |                       |               | 23       | 2,762        | 23                   | 2,762        |                                      |              |                                   |              | 41 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 45       | 34,671       | 27                   | 4,571        | 7                                    | 4,700        | 8                                 | 10,600       | 42 |
| 2                        | 1,783        | 1                    | 450          |                                      |              | 1                                 | 1,333        |                                   |              |                       |               | 101      | 28,472       | 87                   | 17,222       | 13                                   | 9,050        |                                   |              | 43 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 44       | 9,551        | 40                   | 5,726        | 1                                    | 600          | 3                                 | 3,225        | 44 |
| 3                        | 1,160        | 2                    | 410          | 1                                    | 750          |                                   |              |                                   |              |                       |               | 48       | 56,118       | 28                   | 6,018        | 7                                    | 4,700        | 2                                 | 2,000        | 45 |
| 5                        | 2,690        | 2                    | 410          | 3                                    | 2,270        |                                   |              |                                   |              |                       |               | 11       | 3,627        | 9                    | 1,927        | 2                                    | 1,700        |                                   |              | 46 |
| 10                       | 4,856        | 3                    | 200          | 7                                    | 4,656        |                                   |              |                                   |              |                       |               | 140      | 19,001       | 139                  | 18,451       | 1                                    | 550          |                                   |              | 47 |
| 1                        | 225          | 1                    | 225          |                                      |              |                                   |              |                                   |              |                       |               | 6        | 765          | 6                    | 765          |                                      |              |                                   |              | 48 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              | 49 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 10       | 2,490        | 10                   | 2,490        |                                      |              |                                   |              | 50 |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 8        | 1,186        | 8                    | 1,186        |                                      |              |                                   |              | 51 |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 118.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY

| STATE OR TERRITORY |                                 | PRIMARY POWER—continued.          |              |                       |              |              |              |                    |            | GENERATING AND OTHER MAIN-STATION EQUIPMENT. |            |                 |            |                               |         |
|--------------------|---------------------------------|-----------------------------------|--------------|-----------------------|--------------|--------------|--------------|--------------------|------------|----------------------------------------------|------------|-----------------|------------|-------------------------------|---------|
|                    |                                 | Water wheels—Continued.           |              |                       |              | Gas engines. |              | Auxiliary engines. |            | Dynamos.                                     |            |                 |            |                               |         |
|                    |                                 | 2,000 H. P. but under 5,000 H. P. |              | 5,000 H. P. and over. |              |              |              |                    |            | Aggregate.                                   |            |                 |            |                               |         |
|                    |                                 |                                   |              |                       |              |              |              |                    |            | Total.                                       |            | Under 200 K. W. |            | 200 K. W. but under 500 K. W. |         |
|                    |                                 | Num-ber.                          | Horse-power. | Num-ber.              | Horse-power. | Num-ber.     | Horse-power. | Num-ber.           | Kilowatts. | Num-ber.                                     | Kilowatts. | Num-ber.        | Kilowatts. |                               |         |
| 1                  | United States . . . . .         | 111                               | 330,980      | 55                    | 339,800      | 463          | 55,828       | 848                | 65,823     | 12,173                                       | 2,709,225  | 9,491           | 664,440    | 1,547                         | 434,586 |
| 2                  | Alabama . . . . .               |                                   |              |                       |              | 1            | 20           | 4                  | 150        | 104                                          | 17,124     | 78              | 6,309      | 18                            | 4,460   |
| 3                  | Arizona . . . . .               |                                   |              |                       |              | 3            | 70           | 2                  | 90         | 53                                           | 4,939      | 44              | 2,114      | 7                             | 1,825   |
| 4                  | Arkansas . . . . .              |                                   |              |                       |              | 1            | 12           | 7                  | 325        | 105                                          | 9,678      | 96              | 6,803      | 8                             | 2,375   |
| 5                  | California . . . . .            | 32                                | 89,600       | 7                     | 45,700       | 11           | 16,585       | 45                 | 26,345     | 336                                          | 238,490    | 131             | 10,232     | 88                            | 26,035  |
| 6                  | Colorado . . . . .              | 3                                 | 9,600        |                       |              | 4            | 300          | 31                 | 1,546      | 181                                          | 53,130     | 121             | 7,605      | 26                            | 7,025   |
| 7                  | Connecticut . . . . .           |                                   |              |                       |              | 6            | 706          | 12                 | 249        | 220                                          | 39,363     | 175             | 13,568     | 25                            | 6,405   |
| 8                  | Delaware <sup>1</sup> . . . . . |                                   |              |                       |              |              |              | 13                 | 1,205      | 82                                           | 26,733     | 57              | 3,917      | 14                            | 4,216   |
| 9                  | Florida . . . . .               |                                   |              |                       |              | 1            | 40           | 6                  | 126        | 74                                           | 7,804      | 67              | 6,059      | 7                             | 1,745   |
| 10                 | Georgia . . . . .               | 7                                 | 16,800       |                       |              | 1            | 140          | 1                  | 100        | 157                                          | 35,446     | 122             | 9,501      | 13                            | 2,795   |
| 11                 | Idaho . . . . .                 |                                   |              |                       |              |              |              |                    |            | 46                                           | 7,082      | 34              | 2,632      | 7                             | 1,950   |
| 12                 | Illinois . . . . .              |                                   |              |                       |              | 19           | 870          | 52                 | 940        | 947                                          | 209,226    | 819             | 56,028     | 70                            | 21,750  |
| 13                 | Indiana . . . . .               |                                   |              |                       |              | 15           | 1,295        | 32                 | 1,755      | 540                                          | 81,576     | 435             | 31,016     | 71                            | 19,310  |
| 14                 | Iowa . . . . .                  |                                   |              |                       |              | 11           | 564          | 16                 | 436        | 374                                          | 32,056     | 343             | 21,342     | 25                            | 6,864   |
| 15                 | Kansas . . . . .                |                                   |              |                       |              | 19           | 1,678        | 19                 | 946        | 230                                          | 30,307     | 192             | 12,972     | 25                            | 6,835   |
| 16                 | Kentucky . . . . .              |                                   |              |                       |              | 1            | 15           | 10                 | 305        | 175                                          | 29,140     | 140             | 9,355      | 23                            | 5,985   |
| 17                 | Louisiana . . . . .             |                                   |              |                       |              | 3            | 420          | 15                 | 505        | 86                                           | 15,175     | 65              | 4,275      | 12                            | 3,700   |
| 18                 | Maine . . . . .                 |                                   |              |                       |              |              |              | 8                  | 1,071      | 210                                          | 39,290     | 142             | 9,420      | 44                            | 12,750  |
| 19                 | Maryland . . . . .              |                                   |              |                       |              | 5            | 130          | 10                 | 163        | 155                                          | 36,223     | 120             | 7,393      | 21                            | 4,930   |
| 20                 | Massachusetts . . . . .         |                                   |              |                       |              | 12           | 1,097        | 16                 | 840        | 614                                          | 135,924    | 463             | 33,440     | 87                            | 26,509  |
| 21                 | Michigan . . . . .              |                                   |              | 4                     | 22,000       | 11           | 603          | 26                 | 758        | 544                                          | 101,714    | 430             | 28,813     | 74                            | 21,901  |
| 22                 | Minnesota . . . . .             | 4                                 | 16,800       | 3                     | 39,000       | 22           | 1,428        | 22                 | 646        | 381                                          | 78,516     | 322             | 19,786     | 35                            | 9,690   |
| 23                 | Mississippi . . . . .           |                                   |              |                       |              | 1            | 25           | 10                 | 675        | 102                                          | 9,884      | 88              | 6,609      | 13                            | 2,775   |
| 24                 | Missouri . . . . .              |                                   |              |                       |              | 13           | 963          | 126                | 6,407      | 295                                          | 68,467     | 254             | 17,142     | 18                            | 5,175   |
| 25                 | Montana . . . . .               | 8                                 | 29,280       |                       |              |              |              |                    |            | 94                                           | 39,602     | 51              | 3,442      | 20                            | 5,710   |
| 26                 | Nebraska . . . . .              |                                   |              |                       |              | 17           | 845          | 20                 | 975        | 171                                          | 20,041     | 156             | 9,461      | 9                             | 2,130   |
| 27                 | Nevada . . . . .                | 1                                 | 2,200        |                       |              | 6            | 485          | 1                  | 25         | 14                                           | 5,690      | 9               | 490        |                               |         |
| 28                 | New Hampshire . . . . .         |                                   |              |                       |              | 8            | 1,115        | 13                 | 1,005      | 140                                          | 31,917     | 82              | 7,297      | 35                            | 8,370   |
| 29                 | New Jersey . . . . .            |                                   |              |                       |              | 11           | 1,328        | 30                 | 1,535      | 345                                          | 70,566     | 224             | 18,056     | 82                            | 21,285  |
| 30                 | New Mexico . . . . .            |                                   |              |                       |              |              |              |                    |            | 38                                           | 3,789      | 35              | 2,764      | 2                             | 525     |
| 31                 | New York . . . . .              | 24                                | 62,800       | 25                    | 146,500      | 26           | 3,315        | 55                 | 3,381      | 1,072                                        | 482,031    | 746             | 57,609     | 160                           | 48,661  |
| 32                 | North Carolina . . . . .        |                                   |              |                       |              |              |              | 8                  | 480        | 125                                          | 13,911     | 108             | 7,836      | 13                            | 3,575   |
| 33                 | North Dakota . . . . .          |                                   |              |                       |              | 2            | 205          | 3                  | 152        | 64                                           | 5,819      | 58              | 4,349      | 6                             | 1,470   |
| 34                 | Ohio . . . . .                  |                                   |              |                       |              | 53           | 5,628        | 35                 | 1,195      | 756                                          | 126,533    | 633             | 44,003     | 78                            | 21,630  |
| 35                 | Oklahoma . . . . .              |                                   |              |                       |              | 2            | 200          | 3                  | 74         | 122                                          | 15,499     | 94              | 7,349      | 25                            | 6,150   |
| 36                 | Oregon . . . . .                | 22                                | 73,500       | 3                     | 15,000       | 6            | 182          | 7                  | 504        | 113                                          | 32,587     | 59              | 3,837      | 35                            | 10,995  |
| 37                 | Pennsylvania . . . . .          |                                   |              |                       |              | 66           | 7,469        | 63                 | 6,042      | 1,285                                        | 212,543    | 1,028           | 75,741     | 158                           | 45,267  |
| 38                 | Rhode Island . . . . .          |                                   |              |                       |              | 4            | 1,000        | 18                 | 223        | 110                                          | 21,040     | 88              | 5,395      | 5                             | 1,295   |
| 39                 | South Carolina . . . . .        |                                   |              | 8                     | 41,600       | 1            | 150          | 3                  | 60         | 87                                           | 51,271     | 49              | 3,621      | 5                             | 1,350   |
| 40                 | South Dakota . . . . .          |                                   |              |                       |              | 10           | 528          | 7                  | 199        | 70                                           | 10,046     | 62              | 4,801      | 3                             | 745     |
| 41                 | Tennessee . . . . .             |                                   |              |                       |              |              |              | 12                 | 980        | 127                                          | 20,911     | 101             | 7,001      | 12                            | 3,050   |
| 42                 | Texas . . . . .                 |                                   |              |                       |              | 53           | 3,058        | 41                 | 1,742      | 451                                          | 48,558     | 391             | 21,863     | 42                            | 10,745  |
| 43                 | Utah . . . . .                  | 3                                 | 14,800       |                       |              |              |              |                    |            | 62                                           | 33,592     | 36              | 2,192      | 8                             | 2,100   |
| 44                 | Vermont . . . . .               | 1                                 | 2,200        |                       |              | 4            | 205          | 6                  | 125        | 118                                          | 21,854     | 73              | 5,481      | 37                            | 10,023  |
| 45                 | Virginia . . . . .              |                                   |              |                       |              | 1            | 60           | 2                  | 140        | 83                                           | 9,195      | 73              | 5,295      | 7                             | 1,650   |
| 46                 | Washington . . . . .            | 6                                 | 13,400       | 5                     | 30,000       | 2            | 90           | 12                 | 342        | 128                                          | 66,308     | 83              | 6,678      | 20                            | 5,930   |
| 47                 | West Virginia . . . . .         |                                   |              |                       |              | 9            | 925          | 5                  | 385        | 115                                          | 14,726     | 91              | 6,681      | 18                            | 4,845   |
| 48                 | Wisconsin . . . . .             |                                   |              |                       |              | 22           | 2,079        | 17                 | 626        | 432                                          | 40,711     | 385             | 24,136     | 34                            | 9,575   |
| 49                 | Wyoming . . . . .               |                                   |              |                       |              |              |              | 4                  | 50         | 40                                           | 3,208      | 38              | 2,733      | 2                             | 475     |
| 50                 | Alaska . . . . .                |                                   |              |                       |              |              |              | 2                  | 20         | 25                                           | 2,449      | 22              | 1,574      | 3                             | 875     |
| 51                 | Hawaii and Porto Rico . . . . . |                                   |              |                       |              |              |              | 1                  | 40         | 24                                           | 2,562      | 21              | 1,662      | 3                             | 900     |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## POWER AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907—Continued.

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |             |                                   |             |                                   |             |                       |             |                                   |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
|--------------------------------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|-----------------------|-------------|-----------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|
| Dynamos—Continued.                                     |             |                                   |             |                                   |             |                       |             |                                   |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
| Aggregate—Continued.                                   |             |                                   |             |                                   |             |                       |             | Direct-current, constant-voltage. |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
| 500 K. W. but under 1,000 K. W.                        |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             | 5,000 K. W. and over. |             | Total.                            |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             |
| Num-ber.                                               | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.              | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.        | Kilo-watts. | Num-ber.                      | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. |
| 624                                                    | 390,149     | 281                               | 351,700     | 163                               | 438,350     | 67                    | 430,000     | 3,680                             | 408,460     | 3,128           | 183,865     | 417                           | 115,155     | 102                             | 63,860      | 30                                | 36,550      | 3                                 | 7,000       |
| 6                                                      | 4,125       | 2                                 | 2,200       |                                   |             |                       |             | 29                                | 4,300       | 21              | 1,550       | 7                             | 1,750       |                                 |             | 1                                 | 1,000       |                                   |             |
| 2                                                      | 1,000       |                                   |             |                                   |             |                       |             | 27                                | 737         | 27              | 737         |                               |             |                                 |             |                                   |             |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 36                                | 2,331       | 33              | 1,531       | 3                             | 800         |                                 |             |                                   |             |                                   |             |
| 50                                                     | 35,213      | 31                                | 43,000      | 22                                | 51,500      | 14                    | 72,500      | 68                                | 8,950       | 46              | 2,125       | 20                            | 5,105       | 1                               | 720         | 1                                 | 1,000       |                                   |             |
| 20                                                     | 12,550      | 7                                 | 8,700       | 7                                 | 17,250      |                       |             | 57                                | 4,852       | 46              | 2,102       | 11                            | 2,750       |                                 |             |                                   |             |                                   |             |
| 7                                                      | 3,890       | 12                                | 13,500      | 1                                 | 2,000       |                       |             | 70                                | 7,097       | 64              | 5,847       | 6                             | 1,250       |                                 |             |                                   |             |                                   |             |
| 6                                                      | 3,600       | 1                                 | 1,000       | 2                                 | 4,000       | 2                     | 10,000      | 36                                | 5,280       | 25              | 1,730       | 10                            | 2,950       | 1                               | 600         |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 10                                | 1,070       | 8               | 570         | 2                             | 500         |                                 |             |                                   |             |                                   |             |
| 9                                                      | 5,750       | 13                                | 17,400      |                                   |             |                       |             | 23                                | 1,469       | 20              | 819         | 3                             | 650         |                                 |             |                                   |             |                                   |             |
| 5                                                      | 2,500       |                                   |             |                                   |             |                       |             | 9                                 | 147         | 9               | 147         |                               |             |                                 |             |                                   |             |                                   |             |
| 31                                                     | 19,150      | 13                                | 14,300      | 4                                 | 11,000      | 10                    | 87,000      | 283                               | 34,374      | 237             | 13,764      | 38                            | 13,310      | 6                               | 3,800       | 1                                 | 1,000       | 1                                 | 2,500       |
| 21                                                     | 12,650      | 12                                | 16,600      | 1                                 | 2,000       |                       |             | 126                               | 13,528      | 108             | 6,778       | 14                            | 3,250       | 3                               | 2,000       | 1                                 | 1,500       |                                   |             |
| 5                                                      | 2,850       | 1                                 | 1,000       |                                   |             |                       |             | 168                               | 11,966      | 158             | 8,016       | 8                             | 2,050       | 1                               | 800         | 1                                 | 1,000       |                                   |             |
| 10                                                     | 5,500       | 2                                 | 3,000       | 1                                 | 2,000       |                       |             | 76                                | 6,836       | 68              | 3,876       | 5                             | 1,460       | 3                               | 1,500       |                                   |             |                                   |             |
| 8                                                      | 4,550       | 1                                 | 1,000       | 3                                 | 8,250       |                       |             | 57                                | 5,509       | 50              | 2,709       | 6                             | 2,000       |                                 |             |                                   |             |                                   |             |
| 6                                                      | 4,100       | 3                                 | 3,100       |                                   |             |                       |             | 38                                | 5,724       | 32              | 1,774       | 2                             | 800         | 3                               | 2,100       | 1                                 | 1,050       |                                   |             |
| 23                                                     | 16,120      | 1                                 | 1,000       |                                   |             |                       |             | 56                                | 5,714       | 48              | 2,849       | 4                             | 865         | 4                               | 2,000       |                                   |             |                                   |             |
| 5                                                      | 3,400       | 1                                 | 1,500       | 7                                 | 14,000      | 1                     | 5,000       | 33                                | 2,574       | 28              | 1,574       | 5                             | 1,000       |                                 |             |                                   |             |                                   |             |
| 40                                                     | 24,125      | 20                                | 27,100      | 1                                 | 2,250       | 3                     | 22,500      | 165                               | 26,633      | 134             | 9,808       | 17                            | 4,450       | 10                              | 5,975       | 4                                 | 6,400       |                                   |             |
| 14                                                     | 7,500       | 18                                | 20,500      | 8                                 | 23,000      |                       |             | 127                               | 11,562      | 110             | 5,587       | 15                            | 4,475       | 1                               | 500         | 1                                 | 1,000       |                                   |             |
| 7                                                      | 4,540       | 10                                | 12,000      | 4                                 | 10,000      | 3                     | 22,500      | 185                               | 13,009      | 171             | 8,484       | 13                            | 3,525       |                                 |             | 1                                 | 1,000       |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 22                                | 1,051       | 22              | 1,051       |                               |             |                                 |             |                                   |             |                                   |             |
| 9                                                      | 4,650       | 3                                 | 4,500       | 7                                 | 17,000      | 4                     | 20,000      | 102                               | 10,215      | 91              | 4,105       | 3                             | 980         | 7                               | 3,650       | 1                                 | 1,500       |                                   |             |
| 15                                                     | 10,250      |                                   |             | 8                                 | 20,200      |                       |             | 25                                | 2,166       | 22              | 1,466       | 3                             | 700         |                                 |             |                                   |             |                                   |             |
| 2                                                      | 1,250       | 2                                 | 2,700       | 2                                 | 4,500       |                       |             | 74                                | 4,005       | 71              | 3,230       | 3                             | 775         |                                 |             |                                   |             |                                   |             |
| 4                                                      | 3,000       |                                   |             | 1                                 | 2,200       |                       |             | 3                                 | 60          | 3               | 60          |                               |             |                                 |             |                                   |             |                                   |             |
| 18                                                     | 10,050      | 4                                 | 4,200       | 1                                 | 2,000       |                       |             | 26                                | 3,682       | 19              | 1,232       | 4                             | 950         | 3                               | 1,500       |                                   |             |                                   |             |
| 31                                                     | 21,225      | 7                                 | 7,000       | 1                                 | 3,000       |                       |             | 91                                | 21,114      | 37              | 2,564       | 41                            | 9,450       | 12                              | 8,100       | 1                                 | 1,000       |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 17                                | 925         | 17              | 925         |                               |             |                                 |             |                                   |             |                                   |             |
| 59                                                     | 39,111      | 39                                | 47,800      | 49                                | 155,350     | 19                    | 133,500     | 291                               | 48,768      | 224             | 17,998      | 44                            | 13,050      | 18                              | 12,720      | 5                                 | 5,000       |                                   |             |
| 4                                                      | 2,500       |                                   |             |                                   |             |                       |             | 32                                | 1,956       | 30              | 1,556       | 2                             | 400         |                                 |             |                                   |             |                                   |             |
| 23                                                     | 13,700      | 13                                | 16,700      | 6                                 | 15,500      | 3                     | 15,000      | 45                                | 3,609       | 42              | 2,989       | 3                             | 620         |                                 |             |                                   |             |                                   |             |
| 2                                                      | 1,000       | 1                                 | 1,000       |                                   |             |                       |             | 230                               | 34,298      | 195             | 11,998      | 23                            | 8,000       | 5                               | 3,600       | 6                                 | 8,200       | 1                                 | 2,500       |
| 14                                                     | 8,255       | 5                                 | 9,500       |                                   |             |                       |             | 32                                | 3,120       | 27              | 1,770       | 5                             | 1,350       |                                 |             |                                   |             |                                   |             |
| 70                                                     | 42,635      | 24                                | 26,900      | 1                                 | 2,000       | 4                     | 20,000      | 24                                | 3,877       | 15              | 352         | 7                             | 2,100       | 2                               | 1,425       |                                   |             |                                   |             |
| 13                                                     | 7,100       | 2                                 | 3,000       | 2                                 | 4,250       |                       |             | 388                               | 48,682      | 315             | 22,867      | 61                            | 17,165      | 9                               | 5,150       | 3                                 | 3,500       |                                   |             |
| 16                                                     | 11,500      | 9                                 | 10,800      | 8                                 | 24,000      |                       |             | 35                                | 8,374       | 23              | 2,079       | 5                             | 1,296       | 6                               | 3,000       |                                   |             | 1                                 | 2,000       |
| 3                                                      | 1,500       | 2                                 | 3,000       |                                   |             |                       |             | 5                                 | 191         | 5               | 191         |                               |             |                                 |             |                                   |             |                                   |             |
| 10                                                     | 5,860       | 3                                 | 3,000       | 1                                 | 2,000       |                       |             | 23                                | 1,456       | 23              | 1,456       |                               |             |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 30                                | 2,176       | 27              | 1,176       | 2                             | 500         | 1                               | 500         |                                   |             |                                   |             |
| 11                                                     | 6,950       | 7                                 | 9,000       |                                   |             |                       |             | 209                               | 12,070      | 194             | 7,345       | 12                            | 2,775       | 3                               | 1,950       |                                   |             |                                   |             |
| 10                                                     | 6,700       | 2                                 | 2,000       | 4                                 | 9,600       | 2                     | 11,000      | 13                                | 522         | 13              | 522         |                               |             |                                 |             |                                   |             |                                   |             |
| 6                                                      | 3,350       | 1                                 | 1,000       | 1                                 | 2,000       |                       |             | 11                                | 863         | 9               | 463         | 2                             | 400         |                                 |             |                                   |             |                                   |             |
| 3                                                      | 2,250       |                                   |             |                                   |             |                       |             | 22                                | 1,252       | 22              | 1,252       |                               |             |                                 |             |                                   |             |                                   |             |
| 4                                                      | 2,500       | 9                                 | 12,700      | 10                                | 27,500      | 2                     | 11,000      | 30                                | 5,484       | 24              | 1,184       | 2                             | 400         | 2                               | 1,500       | 2                                 | 2,400       |                                   |             |
| 6                                                      | 3,200       |                                   |             |                                   |             |                       |             | 31                                | 2,255       | 30              | 2,055       | 1                             | 200         |                                 |             |                                   |             |                                   |             |
| 13                                                     | 7,000       |                                   |             |                                   |             |                       |             | 172                               | 9,804       | 167             | 8,679       | 5                             | 1,125       |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 18                                | 923         | 18              | 923         |                               |             |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 10                                | 419         | 10              | 419         |                               |             |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 11                                | 797         | 10              | 597         | 1                             | 200         |                                 |             |                                   |             |                                   |             |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 118.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY

| STATE OR TERRITORY.           | GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |             |                 |             |                               |             |                                 |             |                                   |             |                                                  |             |                 |             |
|-------------------------------|--------------------------------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|--------------------------------------------------|-------------|-----------------|-------------|
|                               | Dynamoes—Continued.                                    |             |                 |             |                               |             |                                 |             |                                   |             |                                                  |             |                 |             |
|                               | Direct-current, constant-amperage.                     |             |                 |             |                               |             |                                 |             |                                   |             | Alternating single-phase and poly-phase current. |             |                 |             |
|                               | Total.                                                 |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | Total.                                           |             | Under 200 K. W. |             |
|                               | Num-ber.                                               | Kilo-watts. | Num-ber.        | Kilo-watts. | Num-ber.                      | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                                         | Kilo-watts. | Num-ber.        | Kilo-watts. |
| 1 United States.....          | 1,685                                                  | 80,992      | 1,664           | 71,649      | 16                            | 4,833       | 3                               | 2,010       | 2                                 | 2,500       | 6,808                                            | 2,221,773   | 4,699           | 408,926     |
| 2 Alabama.....                | 1                                                      | 42          | 1               | 42          |                               |             |                                 |             |                                   |             | 74                                               | 12,782      | 56              | 4,717       |
| 3 Arizona.....                | 1                                                      | 40          | 1               | 40          |                               |             |                                 |             |                                   |             | 25                                               | 4,162       | 16              | 1,337       |
| 4 Arkansas.....               | 4                                                      | 268         | 4               | 268         |                               |             |                                 |             |                                   |             | 65                                               | 7,079       | 59              | 5,004       |
| 5 California.....             | 5                                                      | 169         | 5               | 169         |                               |             |                                 |             |                                   |             | 263                                              | 229,361     | 80              | 7,938       |
| 6 Colorado.....               | 19                                                     | 1,177       | 19              | 1,177       |                               |             |                                 |             |                                   |             | 105                                              | 47,101      | 56              | 4,326       |
| 7 Connecticut.....            | 51                                                     | 1,650       | 51              | 1,650       |                               |             |                                 |             |                                   |             | 99                                               | 30,616      | 60              | 6,071       |
| 8 Delaware <sup>1</sup> ..... | 16                                                     | 712         | 16              | 712         |                               |             |                                 |             |                                   |             | 30                                               | 20,741      | 16              | 1,475       |
| 9 Florida.....                | 4                                                      | 404         | 4               | 404         |                               |             |                                 |             |                                   |             | 60                                               | 6,330       | 55              | 5,085       |
| 10 Georgia.....               | 8                                                      | 233         | 8               | 233         |                               |             |                                 |             |                                   |             | 126                                              | 33,744      | 94              | 8,449       |
| 11 Idaho.....                 |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 37                                               | 6,935       | 25              | 2,485       |
| 12 Illinois.....              | 193                                                    | 9,876       | 191             | 9,376       | 2                             | 500         |                                 |             |                                   |             | 471                                              | 164,976     | 391             | 32,896      |
| 13 Indiana.....               | 121                                                    | 5,762       | 119             | 4,994       | 2                             | 768         |                                 |             |                                   |             | 293                                              | 62,286      | 208             | 19,244      |
| 14 Iowa.....                  | 18                                                     | 431         | 18              | 431         |                               |             |                                 |             |                                   |             | 188                                              | 19,759      | 167             | 12,895      |
| 15 Kansas.....                | 11                                                     | 464         | 11              | 464         |                               |             |                                 |             |                                   |             | 143                                              | 23,007      | 113             | 8,632       |
| 16 Kentucky.....              | 13                                                     | 435         | 13              | 435         |                               |             |                                 |             |                                   |             | 105                                              | 23,196      | 77              | 6,211       |
| 17 Louisiana.....             | 1                                                      | 38          | 1               | 38          |                               |             |                                 |             |                                   |             | 47                                               | 9,413       | 32              | 2,463       |
| 18 Maine.....                 | 26                                                     | 1,291       | 24              | 726         | 2                             | 565         |                                 |             |                                   |             | 128                                              | 32,285      | 70              | 5,845       |
| 19 Maryland.....              | 55                                                     | 2,324       | 55              | 2,324       |                               |             |                                 |             |                                   |             | 67                                               | 31,315      | 37              | 3,485       |
| 20 Massachusetts.....         | 161                                                    | 7,259       | 161             | 7,259       |                               |             |                                 |             |                                   |             | 288                                              | 102,032     | 168             | 16,373      |
| 21 Michigan.....              | 95                                                     | 3,527       | 95              | 3,527       |                               |             |                                 |             |                                   |             | 322                                              | 86,625      | 225             | 19,699      |
| 22 Minnesota.....             | 38                                                     | 1,345       | 38              | 1,345       |                               |             |                                 |             |                                   |             | 158                                              | 64,162      | 113             | 9,957       |
| 23 Mississippi.....           |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 80                                               | 8,833       | 66              | 5,558       |
| 24 Missouri.....              | 21                                                     | 723         | 21              | 723         |                               |             |                                 |             |                                   |             | 172                                              | 57,529      | 142             | 12,314      |
| 25 Montana.....               | 9                                                      | 244         | 9               | 244         |                               |             |                                 |             |                                   |             | 60                                               | 37,192      | 20              | 1,732       |
| 26 Nebraska.....              | 1                                                      | 75          | 1               | 75          |                               |             |                                 |             |                                   |             | 96                                               | 15,961      | 84              | 6,156       |
| 27 Nevada.....                |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 11                                               | 5,630       | 6               | 430         |
| 28 New Hampshire.....         | 2                                                      | 100         | 2               | 100         |                               |             |                                 |             |                                   |             | 112                                              | 28,135      | 61              | 5,965       |
| 29 New Jersey.....            | 75                                                     | 3,870       | 75              | 3,870       |                               |             |                                 |             |                                   |             | 179                                              | 46,582      | 112             | 11,622      |
| 30 New Mexico.....            |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 21                                               | 2,864       | 18              | 1,839       |
| 31 New York.....              | 145                                                    | 11,146      | 137             | 5,996       | 4                             | 1,400       | 2                               | 1,250       | 2                                 | 2,500       | 636                                              | 422,117     | 385             | 33,615      |
| 32 North Carolina.....        | 6                                                      | 191         | 6               | 191         |                               |             |                                 |             |                                   |             | 87                                               | 11,764      | 72              | 6,089       |
| 33 North Dakota.....          | 4                                                      | 180         | 4               | 180         |                               |             |                                 |             |                                   |             | 15                                               | 2,030       | 12              | 1,180       |
| 34 Ohio.....                  | 143                                                    | 5,823       | 143             | 5,823       |                               |             |                                 |             |                                   |             | 383                                              | 96,412      | 295             | 26,182      |
| 35 Oklahoma.....              |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 90                                               | 12,379      | 67              | 5,579       |
| 36 Oregon.....                |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 89                                               | 28,710      | 44              | 3,485       |
| 37 Pennsylvania.....          | 307                                                    | 16,619      | 301             | 14,559      | 5                             | 1,300       | 1                               | 760         |                                   |             | 590                                              | 147,242     | 412             | 38,315      |
| 38 Rhode Island.....          | 45                                                     | 1,807       | 45              | 1,807       |                               |             |                                 |             |                                   |             | 30                                               | 10,859      | 20              | 1,509       |
| 39 South Carolina.....        |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 82                                               | 51,060      | 44              | 3,430       |
| 40 South Dakota.....          | 2                                                      | 32          | 2               | 32          |                               |             |                                 |             |                                   |             | 45                                               | 8,558       | 37              | 3,313       |
| 41 Tennessee.....             | 2                                                      | 89          | 2               | 89          |                               |             |                                 |             |                                   |             | 95                                               | 18,646      | 72              | 5,736       |
| 42 Texas.....                 | 8                                                      | 275         | 8               | 275         |                               |             |                                 |             |                                   |             | 234                                              | 36,213      | 189             | 14,243      |
| 43 Utah.....                  |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 49                                               | 33,070      | 23              | 1,670       |
| 44 Vermont.....               | 12                                                     | 538         | 11              | 238         | 1                             | 300         |                                 |             |                                   |             | 95                                               | 20,453      | 53              | 4,780       |
| 45 Virginia.....              | 8                                                      | 234         | 8               | 234         |                               |             |                                 |             |                                   |             | 53                                               | 7,709       | 43              | 3,909       |
| 46 Washington.....            |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 98                                               | 60,824      | 59              | 5,494       |
| 47 West Virginia.....         | 13                                                     | 509         | 13              | 509         |                               |             |                                 |             |                                   |             | 71                                               | 11,962      | 48              | 4,117       |
| 48 Wisconsin.....             | 40                                                     | 1,000       | 40              | 1,000       |                               |             |                                 |             |                                   |             | 220                                              | 29,907      | 178             | 14,457      |
| 49 Wyoming.....               | 1                                                      | 80          | 1               | 80          |                               |             |                                 |             |                                   |             | 21                                               | 2,205       | 19              | 1,730       |
| 50 Alaska.....                |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 15                                               | 2,030       | 12              | 1,155       |
| 51 Hawaii and Porto Rico..... | 3                                                      | 90          | 3               | 90          |                               |             |                                 |             |                                   |             | 10                                               | 1,675       | 8               | 975         |

<sup>1</sup> Includes 1 station in District of Columbia in order that the operations of individual stations may not be disclosed.

## POWER AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907—Continued.

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued.    |             |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         |                                               |  |
|-----------------------------------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|-----------------------|-------------|---------------|-------------|-----------|-------------|-----------|-------------|-----------------------------------------|-----------------------------------------------|--|
| Dynamoes—Continued.                                       |             |                                 |             |                                   |             |                                   |             |                       |             | Transformers. |             | Boosters. |             | Rotaries. |             | Storage-battery cells in main stations. | Kilowatt capacity of miscellaneous apparatus. |  |
| Alternating single-phase and polyphase current—Continued. |             |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         |                                               |  |
| 200 K. W. but under 500 K. W.                             |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             | 5,000 K. W. and over. |             | Number.       | Kilo-watts. | Number.   | Kilo-watts. | Number.   | Kilo-watts. |                                         |                                               |  |
| Number.                                                   | Kilo-watts. | Number.                         | Kilo-watts. | Number.                           | Kilo-watts. | Number.                           | Kilo-watts. | Number.               | Kilo-watts. |               |             |           |             |           |             |                                         |                                               |  |
| 1,114                                                     | 314,598     | 519                             | 324,249     | 249                               | 312,650     | 160                               | 431,350     | 67                    | 430,000     | 1,577         | 592,708     | 127       | 4,810       | 180       | 52,416      | 9,751                                   | 43,209                                        |  |
| 11                                                        | 2,740       | 6                               | 4,125       | 1                                 | 1,200       |                                   |             |                       |             | 12            | 3,801       |           |             | 2         | 600         |                                         | 15                                            |  |
| 7                                                         | 1,825       | 2                               | 1,000       |                                   |             |                                   |             |                       |             | 2             | 266         | 3         | 85          | 2         | 300         |                                         | 16                                            |  |
| 5                                                         | 1,575       | 1                               | 500         |                                   |             |                                   |             |                       |             |               |             |           |             | 2         | 680         |                                         | 45                                            |  |
| 68                                                        | 20,930      | 49                              | 34,493      | 30                                | 42,000      | 22                                | 51,500      | 14                    | 72,500      | 268           | 131,575     | 4         | 136         | 6         | 2,000       | 118                                     | 70                                            |  |
| 15                                                        | 4,275       | 20                              | 12,550      | 7                                 | 8,700       | 7                                 | 17,250      |                       |             | 73            | 21,251      | 7         | 414         | 1         | 350         | 268                                     | 470                                           |  |
| 19                                                        | 5,155       | 7                               | 3,890       | 12                                | 13,500      | 1                                 | 2,000       |                       |             | 10            | 6,885       | 2         | 250         | 2         | 300         |                                         | 60                                            |  |
| 4                                                         | 1,266       | 5                               | 3,000       | 1                                 | 1,000       | 2                                 | 4,000       | 2                     | 10,000      | 3             | 130         | 4         | 266         | 1         | 500         | 204                                     | 2,670                                         |  |
| 5                                                         | 1,245       |                                 |             |                                   |             |                                   |             |                       |             | 21            | 290         |           |             | 1         | 275         |                                         | 12                                            |  |
| 10                                                        | 2,145       | 9                               | 5,750       | 13                                | 17,400      |                                   |             |                       |             | 17            | 15,900      | 1         | 22          |           |             |                                         | 25                                            |  |
| 7                                                         | 1,950       | 5                               | 2,500       |                                   |             |                                   |             |                       |             | 22            | 2,690       | 1         | 40          |           |             |                                         | 19                                            |  |
| 30                                                        | 7,940       | 25                              | 15,350      | 12                                | 13,300      | 3                                 | 8,500       | 10                    | 87,000      | 53            | 4,656       | 13        | 324         | 13        | 3,695       | 1,285                                   | 1,898                                         |  |
| 55                                                        | 15,292      | 18                              | 10,650      | 11                                | 15,100      | 1                                 | 2,000       |                       |             | 43            | 3,749       |           |             | 9         | 2,338       |                                         | 80                                            |  |
| 17                                                        | 4,814       | 4                               | 2,050       |                                   |             |                                   |             |                       |             | 12            | 498         | 2         | 25          | 4         | 866         | 572                                     | 420                                           |  |
| 20                                                        | 5,375       | 7                               | 4,000       | 2                                 | 3,000       | 1                                 | 2,000       |                       |             | 42            | 6,517       | 1         | 30          |           |             | 280                                     | 1,043                                         |  |
| 17                                                        | 3,985       | 7                               | 3,750       | 1                                 | 1,000       | 3                                 | 8,250       |                       |             | 9             | 504         | 5         | 22          |           |             |                                         | 115                                           |  |
| 10                                                        | 2,900       | 3                               | 2,000       | 2                                 | 2,050       |                                   |             |                       |             |               |             | 1         | 10          | 3         | 650         | 36                                      |                                               |  |
| 38                                                        | 11,320      | 19                              | 14,120      | 1                                 | 1,000       |                                   |             |                       |             | 23            | 10,648      | 1         | 60          |           |             |                                         | 17                                            |  |
| 16                                                        | 3,930       | 5                               | 3,400       | 1                                 | 1,500       | 7                                 | 14,000      | 1                     | 5,000       | 4             | 160         | 3         | 26          | 1         | 300         | 228                                     | 200                                           |  |
| 70                                                        | 22,059      | 30                              | 18,150      | 16                                | 20,700      | 1                                 | 2,250       | 3                     | 22,500      | 46            | 2,871       | 4         | 202         | 7         | 2,000       | 67                                      | 860                                           |  |
| 59                                                        | 17,426      | 13                              | 7,000       | 17                                | 19,500      | 8                                 | 23,000      |                       |             | 55            | 20,484      | 9         | 272         | 21        | 6,100       | 646                                     | 1,178                                         |  |
| 22                                                        | 6,165       | 7                               | 4,540       | 9                                 | 11,000      | 4                                 | 10,000      | 3                     | 22,500      | 48            | 40,172      | 6         | 104         |           |             | 376                                     | 1,353                                         |  |
| 13                                                        | 2,775       | 1                               | 500         |                                   |             |                                   |             |                       |             | 4             | 102         | 2         | 15          | 2         | 600         |                                         | 20                                            |  |
| 15                                                        | 4,215       | 2                               | 1,000       | 2                                 | 3,000       | 7                                 | 17,000      | 4                     | 20,000      | 12            | 377         | 2         | 15          | 1         | 200         | 203                                     | 95                                            |  |
| 17                                                        | 5,010       | 15                              | 10,250      | 8                                 | 20,200      | 8                                 | 20,200      |                       |             | 40            | 34,175      | 3         | 45          | 1         | 200         |                                         | 795                                           |  |
| 6                                                         | 1,355       | 2                               | 1,250       | 2                                 | 2,700       | 2                                 | 4,500       |                       |             | 4             | 152         | 1         | 2           | 3         | 1,300       | 60                                      |                                               |  |
|                                                           |             | 4                               | 3,000       |                                   |             | 1                                 | 2,200       |                       |             | 12            | 4,200       | 1         | 8           | 1         | 500         | 64                                      |                                               |  |
| 31                                                        | 7,420       | 15                              | 8,550       | 4                                 | 4,200       | 1                                 | 2,000       |                       |             | 6             | 300         |           |             |           |             | 236                                     | 7                                             |  |
| 41                                                        | 11,835      | 19                              | 13,125      | 6                                 | 6,000       | 1                                 | 3,000       |                       |             | 10            | 132         | 7         | 566         | 11        | 3,835       | 974                                     | 584                                           |  |
| 2                                                         | 525         | 1                               | 500         |                                   |             |                                   |             |                       |             | 3             | 22          |           |             |           |             |                                         | 2                                             |  |
| 112                                                       | 34,211      | 39                              | 25,141      | 32                                | 40,300      | 49                                | 155,350     | 19                    | 133,500     | 263           | 92,538      | 22        | 570         | 27        | 7,914       | 1,199                                   | 18,968                                        |  |
| 11                                                        | 3,175       | 4                               | 2,500       |                                   |             |                                   |             |                       |             | 9             | 1,664       | 1         | 30          |           |             |                                         |                                               |  |
| 3                                                         | 850         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             | 2         | 108         |                                         | 289                                           |  |
| 55                                                        | 13,630      | 18                              | 10,100      | 7                                 | 8,500       | 5                                 | 13,000      | 3                     | 15,000      | 42            | 11,820      | 5         | 150         | 8         | 2,975       | 610                                     | 4,063                                         |  |
| 20                                                        | 4,800       | 2                               | 1,000       | 1                                 | 1,000       |                                   |             |                       |             | 8             | 231         | 1         | 7           |           |             |                                         | 350                                           |  |
| 28                                                        | 8,895       | 12                              | 6,830       | 5                                 | 9,500       |                                   |             |                       |             | 42            | 13,397      |           |             |           |             |                                         | 625                                           |  |
| 92                                                        | 26,802      | 60                              | 36,725      | 21                                | 23,400      | 1                                 | 2,000       | 4                     | 20,000      | 74            | 21,666      | 3         | 238         | 20        | 4,470       | 991                                     | 4,354                                         |  |
|                                                           |             | 7                               | 4,100       | 2                                 | 3,000       | 1                                 | 2,250       |                       |             | 34            | 3,225       | 5         | 462         | 5         | 2,100       | 548                                     |                                               |  |
| 5                                                         | 1,350       | 16                              | 11,500      | 9                                 | 10,800      | 8                                 | 24,000      |                       |             | 43            | 29,788      |           |             |           |             |                                         | 55                                            |  |
| 3                                                         | 745         | 3                               | 1,500       | 2                                 | 3,000       |                                   |             |                       |             | 5             | 1,250       |           |             | 1         | 150         | 266                                     |                                               |  |
| 10                                                        | 2,550       | 9                               | 5,360       | 3                                 | 3,000       | 1                                 | 2,000       |                       |             | 12            | 2,605       | 1         | 4           | 7         | 2,300       |                                         | 885                                           |  |
| 30                                                        | 7,970       | 8                               | 5,000       | 7                                 | 9,000       |                                   |             |                       |             | 8             | 429         | 2         | 240         | 7         | 1,700       |                                         | 535                                           |  |
| 8                                                         | 2,100       | 10                              | 6,700       | 2                                 | 2,000       | 4                                 | 9,600       | 2                     | 11,000      | 56            | 35,762      |           |             |           |             |                                         |                                               |  |
| 34                                                        | 9,323       | 6                               | 3,350       | 1                                 | 1,000       | 1                                 | 2,000       |                       |             | 36            | 4,408       |           |             |           |             | 189                                     |                                               |  |
| 7                                                         | 1,650       | 3                               | 2,250       |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         | 37                                            |  |
| 18                                                        | 5,530       | 2                               | 1,000       | 7                                 | 10,300      | 10                                | 27,500      | 2                     | 11,000      | 62            | 56,643      | 2         | 151         | 5         | 1,510       | 55                                      | 208                                           |  |
| 17                                                        | 4,645       | 6                               | 3,200       |                                   |             |                                   |             |                       |             | 13            | 1,584       |           |             |           |             |                                         | 433                                           |  |
| 29                                                        | 8,450       | 13                              | 7,000       |                                   |             |                                   |             |                       |             | 16            | 3,203       | 2         | 19          | 4         | 1,600       | 276                                     | 320                                           |  |
| 2                                                         | 475         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         | 15                                            |  |
| 3                                                         | 875         |                                 |             |                                   |             |                                   |             |                       |             | 6             | 900         |           |             |           |             |                                         |                                               |  |
| 2                                                         | 700         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             | 1         | 250         |                                         |                                               |  |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 119.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—SUBSTATION EQUIPMENT, MOTORS,

| 1  | STATE OR TERRITORY.        | Number of stations. | SUBSTATION PLANTS.       |               |            |           |            |                                       |
|----|----------------------------|---------------------|--------------------------|---------------|------------|-----------|------------|---------------------------------------|
|    |                            |                     | Total kilowatt capacity. | Transformers. |            | Rotaries. |            | Number of cells in storage batteries. |
|    |                            |                     |                          | Number        | Kilowatts. | Number.   | Kilowatts. |                                       |
| 1  | United States.....         | 4,714               | 1,511,102                | 4,211         | 1,100,824  | 490       | 311,003    | 20,187                                |
| 2  | Alabama.....               | 55                  | 4,500                    | 9             | 3,400      |           |            | 256                                   |
| 3  | Arizona.....               | 15                  | 1,490                    | 9             | 1,190      | 2         | 300        | 1,100                                 |
| 4  | Arkansas.....              | 63                  |                          |               |            |           |            |                                       |
| 5  | California.....            | 129                 | 296,306                  | 1,068         | 283,428    | 8         | 2,130      | 1,156                                 |
| 6  | Colorado.....              | 56                  | 19,594                   | 90            | 18,910     | 1         | 400        | 10,748                                |
| 7  | Connecticut.....           | 41                  | 16,520                   | 44            | 11,470     | 11        | 5,050      | 284                                   |
| 8  | Delaware.....              | 14                  | 24,795                   | 21            | 11,900     | 18        | 10,700     | 1,040                                 |
| 9  | Florida.....               | 37                  |                          |               |            |           |            | 1,178                                 |
| 10 | Georgia.....               | 93                  | 15,583                   | 39            | 14,483     | 4         | 600        | 2,195                                 |
| 11 | Idaho.....                 | 42                  | 4,225                    | 61            | 3,925      |           |            | 500                                   |
| 12 | Illinois.....              | 383                 | 92,651                   | 158           | 21,351     | 93        | 69,400     | 300                                   |
| 13 | Indiana.....               | 200                 | 23,611                   | 52            | 19,930     | 12        | 1,615      | 3,018                                 |
| 14 | Iowa.....                  | 192                 | 1,443                    | 28            | 1,411      |           |            | 420                                   |
| 15 | Kansas.....                | 111                 | 5,850                    | 28            | 5,850      |           |            | 2,068                                 |
| 16 | Kentucky.....              | 83                  | 1,200                    |               |            |           |            | 32                                    |
| 17 | Louisiana.....             | 42                  | 6,117                    | 10            | 2,117      | 4         | 3,000      | 1,200                                 |
| 18 | Maine.....                 | 81                  | 12,108                   | 65            | 12,108     |           |            | 1,000                                 |
| 19 | Maryland.....              | 36                  | 16,525                   | 26            | 5,725      | 9         | 7,400      | 3,400                                 |
| 20 | Massachusetts.....         | 120                 | 24,093                   | 163           | 23,181     | 3         | 900        | 1,388                                 |
| 21 | Michigan.....              | 234                 | 88,858                   | 143           | 61,040     | 28        | 9,290      | 299                                   |
| 22 | Minnesota.....             | 171                 | 53,292                   | 77            | 44,440     | 16        | 5,100      | 18,528                                |
| 23 | Mississippi.....           | 68                  | 60                       | 2             | 60         |           |            | 528                                   |
| 24 | Missouri.....              | 162                 | 35,272                   | 116           | 6,347      | 16        | 7,950      | 3,752                                 |
| 25 | Montana.....               | 33                  | 17,742                   | 54            | 16,602     | 2         | 600        | 20,975                                |
| 26 | Nebraska.....              | 98                  | 890                      | 17            | 840        |           |            | 540                                   |
| 27 | Nevada.....                | 9                   | 7,700                    | 34            | 7,700      |           |            | 50                                    |
| 28 | New Hampshire.....         | 56                  | 10,805                   | 58            | 9,855      | 3         | 750        |                                       |
| 29 | New Jersey.....            | 64                  | 9,070                    | 60            | 4,745      | 14        | 4,200      | 200                                   |
| 30 | New Mexico.....            | 15                  |                          |               |            |           |            | 125                                   |
| 31 | New York.....              | 314                 | 487,973                  | 865           | 316,937    | 196       | 161,628    | 9,408                                 |
| 32 | North Carolina.....        | 71                  | 2,250                    | 24            | 2,250      |           |            |                                       |
| 33 | North Dakota.....          | 29                  |                          |               |            |           |            |                                       |
| 34 | Ohio.....                  | 272                 | 18,795                   | 63            | 13,425     | 4         | 1,000      | 4,370                                 |
| 35 | Oklahoma.....              | 72                  |                          |               |            |           |            |                                       |
| 36 | Oregon.....                | 61                  | 40,829                   | 139           | 29,629     | 15        | 10,200     | 1,000                                 |
| 37 | Pennsylvania.....          | 327                 | 53,747                   | 185           | 36,107     | 23        | 5,440      |                                       |
| 38 | Rhode Island.....          | 7                   | 1,823                    | 26            | 1,823      |           |            | 1,108                                 |
| 39 | South Carolina.....        | 40                  | 47,813                   | 158           | 47,813     |           |            | 296                                   |
| 40 | South Dakota.....          | 37                  | 1,390                    | 9             | 1,390      |           |            |                                       |
| 41 | Tennessee.....             | 78                  | 324                      | 12            | 324        |           |            |                                       |
| 42 | Texas.....                 | 218                 | 1,140                    |               |            |           |            | 1,140                                 |
| 43 | Utah.....                  | 31                  | 8,840                    | 48            | 8,840      |           |            |                                       |
| 44 | Vermont.....               | 60                  | 8,728                    | 66            | 8,528      | 1         | 200        |                                       |
| 45 | Virginia.....              | 51                  | 2,055                    | 12            | 2,055      |           |            |                                       |
| 46 | Washington.....            | 71                  | 38,507                   | 114           | 35,357     | 7         | 3,150      | 55                                    |
| 47 | West Virginia.....         | 48                  | 1,805                    | 19            | 1,805      |           |            |                                       |
| 48 | Wisconsin.....             | 206                 | 4,733                    | 38            | 2,483      |           |            | 2,250                                 |
| 49 | Wyoming.....               | 18                  | 50                       | 1             | 50         |           |            |                                       |
| 50 | Alaska.....                | 9                   | 900                      | 6             | 900        |           |            |                                       |
| 51 | Hawaii and Porto Rico..... | 6                   |                          |               |            |           |            |                                       |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.



## TRANSFORMERS, METERS, CUSTOMERS, AND OUTPUT OF STATIONS, BY STATES AND TERRITORIES: 1907.

| STATIONARY MOTORS. |             | TRANSFORMERS IN CIRCUITS FOR CUSTOMERS. |            | Number of meters on consumption circuits. | Number of customers furnished electric current. | OUTPUT OF STATIONS, KILOWATT HOURS. |                  |    |
|--------------------|-------------|-----------------------------------------|------------|-------------------------------------------|-------------------------------------------------|-------------------------------------|------------------|----|
| Number.            | Horsepower. | Number.                                 | Kilowatts. |                                           |                                                 | Total for year.                     | Average per day. |    |
| 167,184            | 1,649,026   | 299,489                                 | 2,058,567  | 1,683,917                                 | 1,946,979                                       | 5,862,276,737                       | 16,295,709       | 1  |
| 541                | 5,650       | 2,037                                   | 8,890      | 11,436                                    | 16,261                                          | 30,846,764                          | 85,786           | 2  |
| 339                | 2,220       | 605                                     | 3,083      | 5,025                                     | 6,854                                           | 9,392,302                           | 25,731           | 3  |
| 198                | 1,177       | 1,917                                   | 7,396      | 6,503                                     | 12,071                                          | 11,519,316                          | 31,791           | 4  |
| 11,560             | 200,067     | 21,625                                  | 213,633    | 143,384                                   | 178,029                                         | 661,606,309                         | 1,816,169        | 5  |
| 3,232              | 41,161      | 4,046                                   | 45,633     | 41,050                                    | 46,911                                          | 123,275,212                         | 339,288          | 6  |
| 2,741              | 21,146      | 3,657                                   | 24,262     | 20,072                                    | 21,514                                          | 67,406,232                          | 184,720          | 7  |
| 1,630              | 13,053      | 1,546                                   | 8,078      | 11,780                                    | 11,165                                          | 30,543,522                          | 83,681           | 8  |
| 189                | 1,584       | 2,004                                   | 8,183      | 7,970                                     | 10,540                                          | 11,765,994                          | 32,606           | 9  |
| 410                | 11,078      | 3,225                                   | 14,385     | 10,075                                    | 15,452                                          | 59,311,202                          | 163,252          | 10 |
| 406                | 4,054       | 2,011                                   | 10,402     | 7,160                                     | 12,656                                          | 9,577,588                           | 27,963           | 11 |
| 21,675             | 137,661     | 20,331                                  | 99,067     | 146,208                                   | 167,645                                         | 467,657,328                         | 1,284,805        | 12 |
| 5,132              | 33,716      | 12,296                                  | 63,799     | 72,483                                    | 86,237                                          | 130,263,693                         | 362,484          | 13 |
| 2,643              | 14,547      | 4,907                                   | 23,422     | 39,492                                    | 48,516                                          | 37,739,072                          | 103,743          | 14 |
| 1,425              | 12,033      | 3,111                                   | 15,606     | 21,364                                    | 29,292                                          | 59,740,179                          | 164,756          | 15 |
| 1,124              | 9,962       | 4,682                                   | 20,175     | 18,350                                    | 24,282                                          | 37,232,633                          | 103,293          | 16 |
| 1,713              | 16,110      | 3,372                                   | 8,862      | 15,116                                    | 15,972                                          | 26,421,316                          | 72,841           | 17 |
| 1,304              | 19,372      | 4,858                                   | 24,210     | 16,230                                    | 19,614                                          | 66,136,651                          | 190,339          | 18 |
| 4,893              | 19,803      | 3,824                                   | 22,355     | 20,854                                    | 22,168                                          | 47,868,675                          | 131,146          | 19 |
| 15,877             | 81,246      | 16,165                                  | 94,324     | 87,824                                    | 80,713                                          | 219,425,607                         | 601,777          | 20 |
| 7,089              | 53,245      | 10,222                                  | 72,663     | 78,950                                    | 87,500                                          | 208,154,199                         | 571,182          | 21 |
| 3,711              | 41,065      | 6,249                                   | 35,860     | 46,701                                    | 54,214                                          | 87,579,431                          | 270,445          | 22 |
| 181                | 1,520       | 1,958                                   | 9,791      | 9,234                                     | 13,829                                          | 15,704,624                          | 43,246           | 23 |
| 8,923              | 54,111      | 9,531                                   | 46,185     | 50,670                                    | 61,575                                          | 147,328,446                         | 406,919          | 24 |
| 971                | 33,240      | 1,823                                   | 33,691     | 15,105                                    | 17,630                                          | 137,379,261                         | 392,207          | 25 |
| 1,719              | 10,776      | 2,433                                   | 17,146     | 22,710                                    | 27,086                                          | 31,958,739                          | 87,804           | 26 |
| 411                | 6,850       | 836                                     | 4,319      | 2,305                                     | 3,958                                           | 29,621,730                          | 81,620           | 27 |
| 1,061              | 10,231      | 4,030                                   | 18,836     | 11,764                                    | 14,082                                          | 55,258,921                          | 153,562          | 28 |
| 5,994              | 27,604      | 13,830                                  | 56,770     | 55,296                                    | 57,179                                          | 140,527,522                         | 386,866          | 29 |
| 195                | 1,231       | 303                                     | 1,949      | 2,701                                     | 4,494                                           | 4,614,349                           | 12,680           | 30 |
| 18,051             | 393,955     | 32,466                                  | 496,046    | 217,462                                   | 201,701                                         | 1,452,222,471                       | 3,989,701        | 31 |
| 249                | 4,345       | 1,526                                   | 6,395      | 6,068                                     | 9,719                                           | 13,171,681                          | 37,443           | 32 |
| 327                | 1,816       | 343                                     | 1,752      | 6,493                                     | 7,999                                           | 8,229,765                           | 22,641           | 33 |
| 13,083             | 64,941      | 18,991                                  | 91,064     | 92,964                                    | 100,071                                         | 217,311,924                         | 599,779          | 34 |
| 1,086              | 6,586       | 2,259                                   | 12,052     | 13,937                                    | 20,565                                          | 24,985,903                          | 69,428           | 35 |
| 2,072              | 20,452      | 3,439                                   | 26,227     | 21,312                                    | 33,475                                          | 92,807,992                          | 255,833          | 36 |
| 10,063             | 122,461     | 37,578                                  | 195,742    | 142,186                                   | 160,957                                         | 416,554,167                         | 1,161,309        | 37 |
| 2,082              | 12,947      | 2,477                                   | 16,364     | 13,212                                    | 11,591                                          | 35,651,323                          | 97,675           | 38 |
| 969                | 37,388      | 2,456                                   | 11,196     | 6,632                                     | 8,054                                           | 68,696,424                          | 175,540          | 39 |
| 279                | 3,649       | 823                                     | 7,096      | 6,500                                     | 7,940                                           | 13,615,015                          | 40,322           | 40 |
| 1,193              | 4,524       | 3,009                                   | 12,527     | 11,397                                    | 16,426                                          | 34,847,956                          | 101,203          | 41 |
| 4,223              | 18,634      | 8,893                                   | 31,744     | 47,625                                    | 68,447                                          | 75,829,108                          | 210,588          | 42 |
| 406                | 5,519       | 943                                     | 8,233      | 2,197                                     | 11,212                                          | 61,672,661                          | 169,550          | 43 |
| 776                | 9,778       | 3,498                                   | 20,790     | 12,668                                    | 15,361                                          | 29,923,333                          | 82,149           | 44 |
| 268                | 3,690       | 1,295                                   | 7,764      | 2,835                                     | 6,969                                           | 10,208,360                          | 29,347           | 45 |
| 1,933              | 29,696      | 3,843                                   | 63,657     | 38,699                                    | 46,452                                          | 257,785,236                         | 708,034          | 46 |
| 340                | 4,432       | 2,052                                   | 10,327     | 5,936                                     | 9,404                                           | 24,871,317                          | 71,643           | 47 |
| 2,366              | 17,995      | 5,993                                   | 35,710     | 34,773                                    | 44,081                                          | 52,546,210                          | 147,562          | 48 |
| 131                | 685         | 271                                     | 1,901      | 3,199                                     | 5,116                                           | 5,499,084                           | 15,080           | 49 |
| 65                 | 587         | 538                                     | 1,614      | 734                                       | 1,879                                           | 3,390,401                           | 9,366            | 50 |
| 162                | 1,082       | 420                                     | 2,002      | 2,490                                     | 5,059                                           | 5,049,047                           | 13,833           | 51 |

TABLE 120.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC

| ARC LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |                            |                     |            |             |           |         |           |             |           |         |                 |             |           |         |                      |  |  |  |
|-------------------------------------------------|----------------------------|---------------------|------------|-------------|-----------|---------|-----------|-------------|-----------|---------|-----------------|-------------|-----------|---------|----------------------|--|--|--|
| STATE OR TERRITORY.                             |                            | Number of stations. | Total.     |             |           |         |           |             |           |         | Direct-current. |             |           |         | Alternating-current. |  |  |  |
|                                                 |                            |                     | Aggregate. | Commercial. |           | Public. |           | Commercial. |           | Public. |                 | Commercial. |           | Public. |                      |  |  |  |
|                                                 |                            |                     |            | Open.       | Inclosed. | Open.   | Inclosed. | Open.       | Inclosed. | Open.   | Inclosed.       | Open.       | Inclosed. | Open.   | Inclosed.            |  |  |  |
|                                                 |                            |                     |            |             |           |         |           |             |           |         |                 |             |           |         |                      |  |  |  |
| 1                                               | United States.....         | 4,714               | 555,713    | 12,007      | 254,315   | 66,879  | 222,512   | 10,050      | 126,251   | 64,416  | 68,500          | 1,957       | 128,064   | 2,463   | 154,012              |  |  |  |
| 2                                               | Alabama.....               | 55                  | 4,926      | 265         | 2,483     | 68      | 2,110     | .....       | 1,780     | 2       | 119             | 265         | 703       | 66      | 1,991                |  |  |  |
| 3                                               | Arizona.....               | 15                  | 754        | 78          | 409       | 27      | 240       | 6           | 106       | 9       | 27              | 72          | 303       | 18      | 213                  |  |  |  |
| 4                                               | Arkansas.....              | 63                  | 1,699      | 3           | 583       | 9       | 1,074     | 3           | 21        | 9       | 445             | .....       | 562       | .....   | 629                  |  |  |  |
| 5                                               | California.....            | 123                 | 19,691     | 195         | 9,239     | 903     | 9,354     | 66          | 984       | 652     | 411             | 129         | 8,255     | 251     | 8,943                |  |  |  |
| 6                                               | Colorado.....              | 56                  | 5,391      | 88          | 2,230     | 1,692   | 1,381     | 88          | 75        | 1,692   | 67              | .....       | 2,155     | .....   | 1,314                |  |  |  |
| 7                                               | Connecticut.....           | 41                  | 7,639      | 241         | 3,410     | 1,371   | 2,617     | 229         | 1,849     | 1,371   | 589             | 12          | 1,561     | .....   | 2,028                |  |  |  |
| 8                                               | Delaware.....              | 14                  | 4,473      | 37          | 2,601     | 363     | 1,472     | 37          | 1,989     | 363     | 1,373           | .....       | 612       | .....   | 99                   |  |  |  |
| 9                                               | Florida.....               | 37                  | 1,408      | 144         | 128       | 220     | 916       | 144         | 12        | 200     | 24              | .....       | 116       | 20      | 892                  |  |  |  |
| 10                                              | Georgia.....               | 93                  | 3,173      | .....       | 561       | 310     | 2,302     | .....       | 33        | 183     | 78              | .....       | 528       | 127     | 2,224                |  |  |  |
| 11                                              | Idaho.....                 | 42                  | 966        | .....       | 379       | 24      | 563       | .....       | .....     | 5       | 3               | .....       | 379       | 19      | 560                  |  |  |  |
| 12                                              | Illinois.....              | 383                 | 55,309     | 683         | 26,411    | 9,225   | 18,990    | 630         | 14,462    | 9,107   | 5,238           | 53          | 11,949    | 118     | 13,752               |  |  |  |
| 13                                              | Indiana.....               | 200                 | 22,165     | 149         | 8,894     | 4,544   | 8,578     | 103         | 3,429     | 4,491   | 2,400           | 46          | 5,465     | 53      | 6,178                |  |  |  |
| 14                                              | Iowa.....                  | 192                 | 7,352      | 75          | 3,394     | 979     | 2,904     | 73          | 1,730     | 908     | 988             | 2           | 1,664     | 71      | 1,916                |  |  |  |
| 15                                              | Kansas.....                | 111                 | 5,685      | 3           | 2,514     | 269     | 2,899     | 2           | 889       | 269     | 791             | 1           | 1,625     | .....   | 2,108                |  |  |  |
| 16                                              | Kentucky.....              | 83                  | 6,884      | .....       | 1,556     | 318     | 5,010     | .....       | 136       | 318     | 2,666           | .....       | 1,420     | .....   | 2,344                |  |  |  |
| 17                                              | Louisiana.....             | 42                  | 8,587      | .....       | 4,440     | .....   | 4,147     | .....       | 3,115     | .....   | 246             | .....       | 1,325     | .....   | 3,901                |  |  |  |
| 18                                              | Maine.....                 | 81                  | 3,187      | 15          | 1,096     | 326     | 1,750     | 15          | 290       | 326     | 550             | .....       | 806       | .....   | 1,200                |  |  |  |
| 19                                              | Maryland.....              | 36                  | 9,292      | 383         | 5,544     | 1,146   | 2,219     | 383         | 3,138     | 1,146   | 1,837           | .....       | 2,406     | .....   | 382                  |  |  |  |
| 20                                              | Massachusetts.....         | 120                 | 33,869     | 155         | 15,991    | 2,741   | 14,982    | 155         | 8,697     | 2,634   | 6,674           | .....       | 7,294     | 107     | 8,308                |  |  |  |
| 21                                              | Michigan.....              | 234                 | 23,514     | 195         | 9,335     | 2,826   | 11,158    | 163         | 4,235     | 2,511   | 2,361           | 32          | 5,100     | 315     | 8,797                |  |  |  |
| 22                                              | Minnesota.....             | 171                 | 13,398     | 9           | 8,138     | 1,648   | 3,603     | 9           | 5,266     | 1,561   | 1,086           | .....       | 2,872     | 87      | 2,517                |  |  |  |
| 23                                              | Mississippi.....           | 68                  | 1,694      | 14          | 361       | 31      | 1,288     | .....       | 32        | .....   | 82              | 14          | 329       | 31      | 1,206                |  |  |  |
| 24                                              | Missouri.....              | 162                 | 17,576     | 16          | 11,480    | 976     | 5,095     | .....       | 6,693     | 893     | 3,177           | 16          | 4,796     | 83      | 1,918                |  |  |  |
| 25                                              | Montana.....               | 33                  | 3,132      | 13          | 1,986     | 177     | 956       | 10          | 524       | 164     | 77              | 3           | 1,462     | 13      | 879                  |  |  |  |
| 26                                              | Nebraska.....              | 98                  | 4,262      | 21          | 2,061     | 110     | 2,070     | 8           | 78        | 105     | 183             | 13          | 1,983     | 5       | 1,887                |  |  |  |
| 27                                              | Nevada.....                | 9                   | 327        | .....       | 195       | .....   | 132       | .....       | .....     | .....   | .....           | .....       | 195       | .....   | 132                  |  |  |  |
| 28                                              | New Hampshire.....         | 56                  | 3,510      | 4           | 1,564     | 19      | 1,923     | 4           | 32        | 19      | 101             | .....       | 1,532     | .....   | 1,822                |  |  |  |
| 29                                              | New Jersey.....            | 64                  | 21,973     | 8           | 8,814     | 2,644   | 10,507    | 8           | 442       | 2,295   | 2,569           | .....       | 8,372     | 349     | 7,938                |  |  |  |
| 30                                              | New Mexico.....            | 15                  | 332        | 4           | 162       | 3       | 163       | .....       | 59        | .....   | 26              | 4           | 103       | 3       | 137                  |  |  |  |
| 31                                              | New York.....              | 314                 | 97,529     | 399         | 57,028    | 4,347   | 35,755    | 392         | 42,178    | 4,238   | 16,108          | 7           | 14,850    | 109     | 19,647               |  |  |  |
| 32                                              | North Carolina.....        | 71                  | 1,936      | .....       | 249       | 54      | 1,633     | .....       | 17        | 54      | 346             | .....       | 232       | .....   | 1,287                |  |  |  |
| 33                                              | North Dakota.....          | 29                  | 1,163      | .....       | 621       | 36      | 506       | .....       | 530       | 36      | 278             | .....       | 91        | .....   | 228                  |  |  |  |
| 34                                              | Ohio.....                  | 272                 | 43,849     | 3,317       | 15,161    | 4,625   | 20,746    | 2,286       | 10,001    | 4,266   | 5,276           | 1,031       | 5,160     | 359     | 15,470               |  |  |  |
| 35                                              | Oklahoma.....              | 72                  | 3,451      | 12          | 1,563     | 44      | 1,832     | 2           | 85        | .....   | 193             | 10          | 1,478     | 44      | 1,639                |  |  |  |
| 36                                              | Oregon.....                | 61                  | 3,927      | 2           | 1,557     | 1,597   | 771       | .....       | 9         | 1,597   | 3               | 2           | 1,548     | .....   | 768                  |  |  |  |
| 37                                              | Pennsylvania.....          | 327                 | 66,777     | 4,929       | 23,681    | 18,520  | 19,647    | 4,801       | 8,069     | 18,405  | 9,343           | 128         | 15,592    | 115     | 10,304               |  |  |  |
| 38                                              | Rhode Island.....          | 7                   | 5,970      | 1           | 2,631     | 2,399   | 939       | 1           | 1,807     | 2,399   | 164             | .....       | 824       | .....   | 775                  |  |  |  |
| 39                                              | South Carolina.....        | 40                  | 2,521      | .....       | 680       | .....   | 1,841     | .....       | .....     | .....   | 87              | .....       | 680       | .....   | 1,754                |  |  |  |
| 40                                              | South Dakota.....          | 37                  | 1,278      | 15          | 479       | .....   | 784       | .....       | 126       | .....   | 77              | 15          | 353       | .....   | 707                  |  |  |  |
| 41                                              | Tennessee.....             | 78                  | 4,407      | 10          | 1,396     | 54      | 2,947     | .....       | 26        | 39      | 142             | 10          | 1,370     | 15      | 2,805                |  |  |  |
| 42                                              | Texas.....                 | 218                 | 8,176      | 44          | 4,713     | 639     | 2,780     | 35          | 848       | 631     | 234             | 9           | 3,865     | 8       | 2,546                |  |  |  |
| 43                                              | Utah.....                  | 31                  | 440        | .....       | 349       | 4       | 87        | .....       | .....     | .....   | .....           | .....       | 349       | 4       | 87                   |  |  |  |
| 44                                              | Vermont.....               | 60                  | 1,866      | 63          | 461       | 243     | 1,099     | 3           | .....     | 243     | 64              | 60          | 461       | .....   | 1,035                |  |  |  |
| 45                                              | Virginia.....              | 51                  | 1,415      | .....       | 346       | 184     | 885       | .....       | 5         | 179     | 322             | .....       | 341       | 5       | 563                  |  |  |  |
| 46                                              | Washington.....            | 71                  | 6,771      | .....       | 3,768     | .....   | 3,003     | .....       | 1,592     | .....   | 21              | .....       | 2,176     | .....   | 2,982                |  |  |  |
| 47                                              | West Virginia.....         | 48                  | 2,885      | 12          | 1,017     | 612     | 1,244     | .....       | 63        | 589     | 178             | 12          | 954       | 23      | 1,066                |  |  |  |
| 48                                              | Wisconsin.....             | 206                 | 8,697      | 405         | 2,385     | 480     | 5,427     | 394         | 699       | 435     | 1,445           | 11          | 1,686     | 45      | 3,982                |  |  |  |
| 49                                              | Wyoming.....               | 18                  | 517        | .....       | 262       | 72      | 183       | .....       | 80        | 72      | 31              | .....       | 182       | .....   | 152                  |  |  |  |
| 50                                              | Alaska.....                | 9                   | 67         | 1           | 63        | .....   | 3         | 1           | 11        | .....   | 3               | .....       | 52        | .....   | .....                |  |  |  |
| 51                                              | Hawaii and Porto Rico..... | 6                   | 539        | .....       | 139       | 131     | 269       | .....       | 39        | 131     | 112             | .....       | 100       | .....   | 157                  |  |  |  |

<sup>1</sup>Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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## STATIONS—ANALYSIS OF SERVICE, BY STATES AND TERRITORIES: 1907.

| INCANDESCENT LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |              |          |                 |          |                 |          |                        |          | OTHER VARIETIES OF LAMPS—NEONST, VACUUM, VAPORE, ETC. |         | STATIONARY MOTORS. |             |    |
|----------------------------------------------------------|--------------|----------|-----------------|----------|-----------------|----------|------------------------|----------|-------------------------------------------------------|---------|--------------------|-------------|----|
| Aggregate.                                               | Total.       |          | 16-candlepower. |          | 32-candlepower. |          | All other candlepower. |          | Commercial.                                           | Public. | Number.            | Horsepower. |    |
|                                                          | Commercial.  | Public.  | Commercial.     | Public.  | Commercial.     | Public.  | Commercial.            | Public.  |                                                       |         |                    |             |    |
| 41, 445, 997                                             | 40, 637, 304 | 808, 693 | 35, 048, 537    | 502, 075 | 1, 293, 229     | 115, 381 | 4, 295, 538            | 101, 237 | 156, 622                                              | 5, 716  | 167, 184           | 1, 649, 026 | 1  |
| 232, 577                                                 | 230, 434     | 2, 143   | 202, 708        | 1, 837   | 11, 945         | 214      | 15, 781                | 92       | 60                                                    | .....   | 541                | 5, 650      | 2  |
| 72, 001                                                  | 71, 480      | 521      | 59, 295         | 440      | 4, 935          | 72       | 7, 250                 | .....    | 27                                                    | .....   | 339                | 2, 220      | 3  |
| 142, 446                                                 | 140, 115     | 2, 331   | 123, 973        | 702      | 9, 366          | 1, 158   | 6, 776                 | 471      | 79                                                    | .....   | 198                | 1, 177      | 4  |
| 3, 067, 383                                              | 3, 031, 750  | 35, 633  | 2, 482, 026     | 28, 563  | 97, 146         | 4, 658   | 452, 578               | 2, 412   | 769                                                   | 62      | 11, 560            | 200, 067    | 5  |
| 648, 446                                                 | 640, 409     | 8, 037   | 603, 804        | 7, 115   | 15, 704         | 574      | 20, 901                | 348      | 768                                                   | 280     | 3, 232             | 41, 161     | 6  |
| 576, 661                                                 | 569, 614     | 7, 047   | 469, 283        | 2, 932   | 8, 373          | 671      | 91, 958                | 3, 444   | 9, 941                                                | 285     | 2, 741             | 21, 146     | 7  |
| 412, 948                                                 | 407, 942     | 5, 006   | 392, 253        | 3, 777   | 10, 226         | 228      | 5, 463                 | 1, 001   | 3, 282                                                | .....   | 1, 630             | 13, 053     | 8  |
| 141, 258                                                 | 138, 678     | 2, 580   | 130, 120        | 1, 065   | 6, 838          | 861      | 1, 720                 | 654      | 26                                                    | .....   | 189                | 1, 584      | 9  |
| 179, 913                                                 | 175, 838     | 4, 075   | 146, 089        | 2, 899   | 15, 690         | 399      | 14, 109                | 777      | 424                                                   | .....   | 410                | 11, 078     | 10 |
| 122, 460                                                 | 121, 334     | 1, 126   | 94, 428         | 374      | 7, 953          | 662      | 18, 953                | 90       | 31                                                    | .....   | 406                | 4, 054      | 11 |
| 3, 582, 178                                              | 3, 507, 351  | 74, 827  | 2, 713, 110     | 59, 627  | 99, 415         | 9, 652   | 694, 826               | 5, 548   | 8, 735                                                | 396     | 21, 675            | 137, 661    | 12 |
| 1, 325, 182                                              | 1, 308, 452  | 16, 730  | 1, 171, 285     | 12, 930  | 66, 327         | 2, 513   | 70, 840                | 1, 287   | 3, 078                                                | 2, 400  | 5, 132             | 33, 716     | 13 |
| 808, 451                                                 | 792, 996     | 15, 455  | 670, 359        | 4, 616   | 37, 853         | 8, 375   | 84, 784                | 2, 464   | 839                                                   | 96      | 2, 643             | 14, 547     | 14 |
| 471, 876                                                 | 468, 263     | 3, 613   | 356, 797        | 2, 350   | 22, 878         | 831      | 88, 588                | 432      | 722                                                   | 153     | 1, 425             | 12, 033     | 15 |
| 483, 401                                                 | 477, 244     | 6, 157   | 393, 796        | 4, 330   | 12, 521         | 1, 193   | 70, 927                | 634      | 395                                                   | .....   | 1, 124             | 9, 962      | 16 |
| 376, 990                                                 | 367, 835     | 9, 155   | 342, 300        | 7, 972   | 6, 868          | 773      | 18, 667                | 410      | 235                                                   | .....   | 1, 713             | 16, 110     | 17 |
| 442, 940                                                 | 433, 982     | 8, 958   | 359, 375        | 3, 779   | 27, 470         | 2, 761   | 47, 137                | 2, 418   | 252                                                   | .....   | 1, 304             | 19, 372     | 18 |
| 634, 705                                                 | 616, 105     | 18, 600  | 611, 591        | 16, 492  | 1, 799          | 1, 156   | 2, 725                 | 952      | 4, 844                                                | .....   | 4, 893             | 19, 803     | 19 |
| 2, 650, 724                                              | 2, 602, 316  | 48, 408  | 2, 479, 540     | 21, 460  | 51, 560         | 5, 506   | 71, 216                | 21, 442  | 4, 469                                                | 110     | 15, 877            | 81, 246     | 20 |
| 1, 711, 699                                              | 1, 661, 290  | 50, 399  | 1, 386, 798     | 45, 234  | 59, 121         | 2, 867   | 215, 371               | 2, 298   | 5, 293                                                | 357     | 7, 069             | 53, 245     | 21 |
| 900, 119                                                 | 882, 459     | 17, 660  | 782, 260        | 11, 155  | 30, 068         | 4, 156   | 70, 111                | 2, 349   | 2, 856                                                | 48      | 3, 711             | 41, 095     | 22 |
| 141, 027                                                 | 138, 972     | 2, 055   | 119, 299        | 734      | 9, 791          | 906      | 9, 882                 | 415      | 52                                                    | .....   | 181                | 1, 520      | 23 |
| 1, 698, 935                                              | 1, 689, 649  | 9, 286   | 1, 136, 748     | 3, 414   | 42, 757         | 4, 013   | 510, 144               | 1, 859   | 6, 457                                                | 4       | 8, 923             | 54, 111     | 24 |
| 230, 837                                                 | 228, 277     | 1, 560   | 208, 402        | 1, 451   | 11, 280         | 104      | 9, 595                 | 5        | 364                                                   | .....   | 971                | 33, 240     | 25 |
| 488, 932                                                 | 482, 619     | 6, 313   | 384, 072        | 4, 175   | 16, 288         | 1, 845   | 82, 259                | 293      | 1, 169                                                | .....   | 1, 719             | 10, 776     | 26 |
| 63, 904                                                  | 63, 684      | 220      | 60, 175         | 215      | 1, 330          | 5        | 2, 179                 | .....    | 20                                                    | 15      | 411                | 6, 850      | 27 |
| 301, 300                                                 | 292, 458     | 8, 842   | 262, 183        | 4, 794   | 6, 059          | 1, 925   | 24, 216                | 2, 123   | 434                                                   | .....   | 1, 061             | 10, 231     | 28 |
| 1, 673, 082                                              | 1, 648, 762  | 24, 320  | 1, 317, 787     | 3, 723   | 201, 719        | 8, 135   | 129, 256               | 12, 462  | 1, 927                                                | 12      | 5, 994             | 27, 604     | 29 |
| 55, 229                                                  | 54, 537      | 692      | 37, 177         | 625      | 6, 817          | 66       | 10, 543                | 1        | 150                                                   | .....   | 195                | 1, 231      | 30 |
| 6, 991, 406                                              | 6, 753, 211  | 238, 195 | 6, 443, 667     | 218, 638 | 59, 599         | 3, 620   | 249, 945               | 15, 937  | 25, 438                                               | 217     | 18, 051            | 393, 955    | 31 |
| 144, 159                                                 | 141, 490     | 2, 669   | 116, 704        | 1, 028   | 6, 445          | 876      | 18, 341                | 765      | 46                                                    | 51      | 249                | 4, 345      | 32 |
| 118, 875                                                 | 117, 019     | 1, 856   | 82, 934         | 1, 077   | 10, 125         | 497      | 23, 960                | 282      | 358                                                   | .....   | 327                | 1, 816      | 33 |
| 2, 254, 467                                              | 2, 207, 283  | 47, 184  | 1, 870, 192     | 40, 416  | 63, 329         | 4, 361   | 273, 762               | 2, 407   | 13, 166                                               | 325     | 13, 083            | 64, 941     | 34 |
| 218, 884                                                 | 216, 869     | 2, 015   | 204, 942        | 1, 434   | 7, 616          | 487      | 4, 311                 | 94       | 653                                                   | .....   | 1, 086             | 6, 596      | 35 |
| 370, 092                                                 | 364, 640     | 5, 452   | 288, 853        | 2, 945   | 37, 204         | 2, 201   | 38, 583                | 306      | 2, 752                                                | .....   | 2, 072             | 20, 452     | 36 |
| 3, 861, 171                                              | 3, 815, 617  | 45, 554  | 3, 329, 414     | 32, 560  | 83, 830         | 8, 265   | 402, 373               | 4, 729   | 36, 248                                               | 243     | 10, 063            | 122, 461    | 37 |
| 384, 597                                                 | 375, 148     | 9, 449   | 272, 317        | 3, 210   | 11, 882         | 5, 927   | 90, 969                | 312      | 632                                                   | 100     | 2, 082             | 12, 947     | 38 |
| 149, 907                                                 | 147, 547     | 2, 360   | 132, 632        | 1, 742   | 9, 971          | 419      | 4, 944                 | 199      | 110                                                   | 1       | 969                | 37, 388     | 39 |
| 129, 486                                                 | 127, 455     | 2, 031   | 117, 622        | 1, 311   | 3, 864          | 675      | 5, 969                 | 45       | 157                                                   | .....   | 279                | 3, 649      | 40 |
| 306, 818                                                 | 300, 351     | 6, 467   | 274, 254        | 3, 261   | 6, 577          | 1, 542   | 19, 520                | 1, 664   | 85                                                    | .....   | 1, 193             | 4, 524      | 41 |
| 794, 972                                                 | 787, 701     | 7, 271   | 764, 091        | 4, 748   | 10, 955         | 1, 367   | 12, 655                | 1, 156   | 9, 183                                                | 168     | 4, 223             | 18, 634     | 42 |
| 67, 663                                                  | 64, 632      | 3, 031   | 51, 832         | 873      | 4, 785          | 1, 838   | 8, 015                 | 320      | 7                                                     | .....   | 406                | 5, 519      | 43 |
| 305, 593                                                 | 293, 391     | 12, 202  | 265, 334        | 2, 091   | 4, 284          | 8, 614   | 23, 773                | 1, 497   | 432                                                   | 220     | 776                | 9, 778      | 44 |
| 93, 035                                                  | 91, 381      | 1, 654   | 79, 303         | 567      | 6, 519          | 846      | 5, 559                 | 241      | 600                                                   | .....   | 268                | 3, 690      | 45 |
| 618, 809                                                 | 607, 594     | 11, 215  | 381, 188        | 5, 171   | 37, 436         | 2, 950   | 188, 970               | 3, 094   | 5, 968                                                | 88      | 1, 933             | 29, 686     | 46 |
| 159, 800                                                 | 156, 604     | 3, 196   | 139, 498        | 1, 620   | 7, 426          | 1, 162   | 9, 680                 | 414      | 479                                                   | .....   | 340                | 4, 432      | 47 |
| 779, 354                                                 | 765, 063     | 14, 291  | 686, 859        | 9, 909   | 18, 090         | 3, 288   | 60, 114                | 1, 094   | 2, 281                                                | 46      | 2, 366             | 17, 965     | 48 |
| 59, 315                                                  | 58, 463      | 852      | 49, 918         | 685      | 3, 205          | 167      | 5, 340                 | .....    | 320                                                   | 39      | 131                | 685         | 49 |
| 19, 818                                                  | 19, 500      | 318      | 14, 850         | 216      | 1, 355          | 98       | 3, 295                 | 4        | 20                                                    | .....   | 65                 | 587         | 50 |
| 58, 492                                                  | 57, 136      | 1, 356   | 47, 457         | 910      | 3, 083          | 353      | 6, 595                 | 93       | 12                                                    | .....   | 162                | 1, 082      | 51 |

TABLE 121.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF

| SUPPLIES AND MATERIALS.       |                     |                 |              |         |           |         |           |               |           |                     |             |                                                    |                                                   |  |
|-------------------------------|---------------------|-----------------|--------------|---------|-----------|---------|-----------|---------------|-----------|---------------------|-------------|----------------------------------------------------|---------------------------------------------------|--|
| STATE OR TERRITORY.           | Number of stations. | Aggregate cost. | Total cost.  | Meters. |           | Motors. |           | Transformers. |           | Incandescent lamps. |             | Nernst lamps, vacuum and vapor lamps, etc. (cost). | Lamp fittings, etc., except for arc lamps (cost). |  |
|                               |                     |                 |              | Number. | Cost.     | Number. | Cost.     | Number.       | Cost.     | Number.             | Cost.       |                                                    |                                                   |  |
| 1 United States.....          | 4,714               | \$44,458,568    | \$21,400,823 | 31,900  | \$426,625 | 4,646   | \$278,410 | 6,762         | \$337,706 | 19,807,728          | \$3,118,066 | \$73,186                                           | \$762,593                                         |  |
| 2 Alabama.....                | 55                  | 303,045         | 87,032       | 302     | 3,950     | 7       | 570       | 67            | 2,911     | 37,055              | 6,655       |                                                    | 3,855                                             |  |
| 3 Arizona.....                | 15                  | 231,221         | 52,989       | 52      | 882       | 10      | 2,809     | 29            | 1,950     | 29,966              | 5,165       |                                                    | 4,386                                             |  |
| 4 Arkansas.....               | 63                  | 228,766         | 58,799       | 152     | 1,884     |         |           | 77            | 3,271     | 25,118              | 4,531       |                                                    | 1,868                                             |  |
| 5 California.....             | 129                 | 3,062,669       | 1,940,030    | 2,241   | 43,352    | 302     | 48,049    | 460           | 25,637    | 753,301             | 127,164     | 62                                                 | 84,373                                            |  |
| 6 Colorado.....               | 56                  | 822,549         | 333,516      | 497     | 5,935     | 13      | 1,025     | 62            | 4,046     | 259,209             | 44,384      | 328                                                | 20,392                                            |  |
| 7 Connecticut.....            | 41                  | 581,762         | 247,029      | 138     | 2,479     |         |           | 35            | 2,924     | 300,789             | 53,534      | 819                                                | 1,834                                             |  |
| 8 Delaware.....               | 14                  | 351,833         | 196,534      | 93      | 1,149     |         |           | 59            | 2,345     | 237,352             | 41,680      | 200                                                | 471                                               |  |
| 9 Florida.....                | 37                  | 241,360         | 54,036       | 44      | 661       | 3       | 419       | 40            | 1,719     | 33,286              | 6,208       | 25                                                 | 7,249                                             |  |
| 10 Georgia.....               | 93                  | 273,398         | 106,757      | 72      | 783       | 4       | 216       | 38            | 1,319     | 60,686              | 10,213      | 173                                                | 5,597                                             |  |
| 11 Idaho.....                 | 42                  | 177,086         | 137,625      | 249     | 4,139     | 24      | 800       | 64            | 6,096     | 41,415              | 9,433       | 175                                                | 5,804                                             |  |
| 12 Illinois.....              | 383                 | 3,382,708       | 1,376,655    | 2,122   | 26,403    | 76      | 5,798     | 629           | 25,112    | 2,187,068           | 329,205     | 875                                                | 91,069                                            |  |
| 13 Indiana.....               | 200                 | 1,372,494       | 509,059      | 3,627   | 41,944    | 64      | 7,963     | 567           | 35,137    | 397,792             | 67,239      | 722                                                | 17,529                                            |  |
| 14 Iowa.....                  | 192                 | 900,519         | 367,081      | 804     | 11,167    | 25      | 1,934     | 185           | 7,426     | 182,685             | 35,677      | 554                                                | 18,158                                            |  |
| 15 Kansas.....                | 111                 | 477,208         | 175,798      | 344     | 5,862     | 82      | 5,318     | 50            | 2,200     | 159,137             | 27,326      | 573                                                | 18,397                                            |  |
| 16 Kentucky.....              | 83                  | 500,214         | 201,944      | 153     | 2,043     | 32      | 2,844     | 92            | 3,287     | 144,517             | 23,251      | 93                                                 | 10,119                                            |  |
| 17 Louisiana.....             | 42                  | 485,772         | 196,193      | 68      | 731       |         |           | 64            | 1,910     | 228,314             | 33,988      | 129                                                | 4,498                                             |  |
| 18 Maine.....                 | 81                  | 336,848         | 220,159      | 135     | 1,678     | 78      | 15,100    | 45            | 3,037     | 100,178             | 29,481      | 714                                                | 38,781                                            |  |
| 19 Maryland.....              | 36                  | 547,314         | 222,156      | 92      | 1,653     | 6       | 750       | 101           | 2,896     | 416,432             | 80,298      | 1,436                                              | 3,131                                             |  |
| 20 Massachusetts.....         | 120                 | 2,815,741       | 1,438,911    | 4,056   | 54,880    | 258     | 37,485    | 414           | 30,812    | 1,952,204           | 318,372     | 2,135                                              | 6,451                                             |  |
| 21 Michigan.....              | 234                 | 1,943,393       | 1,090,659    | 685     | 7,371     | 54      | 4,552     | 193           | 6,865     | 757,175             | 142,222     | 4,517                                              | 29,378                                            |  |
| 22 Minnesota.....             | 171                 | 1,121,345       | 580,410      | 746     | 9,527     | 4       | 314       | 141           | 6,489     | 415,642             | 70,304      | 414                                                | 35,073                                            |  |
| 23 Mississippi.....           | 68                  | 214,906         | 47,173       | 127     | 1,688     | 25      | 2,062     | 41            | 1,456     | 29,880              | 5,215       |                                                    | 5,041                                             |  |
| 24 Missouri.....              | 162                 | 1,484,961       | 717,251      | 900     | 22,774    | 35      | 3,320     | 270           | 10,347    | 447,542             | 69,524      | 8,403                                              | 23,217                                            |  |
| 25 Montana.....               | 33                  | 423,369         | 300,818      | 491     | 5,552     | 10      | 2,193     | 32            | 837       | 101,496             | 17,633      | 50                                                 | 1,497                                             |  |
| 26 Nebraska.....              | 98                  | 476,136         | 168,144      | 291     | 3,983     | 22      | 1,387     | 25            | 1,772     | 243,291             | 41,544      | 1,552                                              | 17,066                                            |  |
| 27 Nevada.....                | 9                   | 66,467          | 50,600       | 1       | 20        | 6       | 1,765     | 30            | 3,805     | 10,101              | 2,258       |                                                    | 205                                               |  |
| 28 New Hampshire.....         | 56                  | 255,178         | 112,927      | 474     | 6,682     | 19      | 2,349     | 87            | 3,508     | 72,504              | 14,227      | 234                                                | 4,525                                             |  |
| 29 New Jersey.....            | 64                  | 1,694,281       | 691,810      | 4,617   | 48,307    | 75      | 1,427     | 389           | 18,726    | 1,021,106           | 165,089     | 419                                                | 3,031                                             |  |
| 30 New Mexico.....            | 15                  | 101,197         | 48,399       | 6       | 84        | 3       | 375       | 2             | 275       | 7,402               | 1,252       |                                                    | 2,110                                             |  |
| 31 New York.....              | 314                 | 7,030,328       | 4,028,067    | 1,012   | 17,291    | 2,722   | 77,609    | 288           | 12,805    | 4,515,759           | 595,938     | 16,323                                             | 67,156                                            |  |
| 32 North Carolina.....        | 71                  | 197,012         | 62,948       | 6       | 80        |         |           | 16            | 827       | 36,968              | 7,019       | 55                                                 | 3,698                                             |  |
| 33 North Dakota.....          | 29                  | 215,590         | 33,186       | 173     | 2,795     | 8       | 290       | 6             | 303       | 16,844              | 2,991       | 62                                                 | 797                                               |  |
| 34 Ohio.....                  | 272                 | 2,177,633       | 869,760      | 1,406   | 19,054    | 4       | 305       | 424           | 17,751    | 764,552             | 112,971     | 1,106                                              | 25,397                                            |  |
| 35 Oklahoma.....              | 72                  | 360,138         | 71,885       | 119     | 1,487     |         |           | 89            | 3,703     | 36,384              | 6,604       | 150                                                | 884                                               |  |
| 36 Oregon.....                | 61                  | 304,471         | 130,883      | 212     | 3,461     |         |           | 46            | 3,273     | 124,998             | 18,672      | 3                                                  | 2,187                                             |  |
| 37 Pennsylvania.....          | 327                 | 4,310,011       | 2,334,458    | 1,580   | 18,225    | 246     | 26,670    | 538           | 19,941    | 2,081,458           | 334,192     | 13,714                                             | 48,526                                            |  |
| 38 Rhode Island.....          | 7                   | 411,028         | 165,642      | 244     | 3,555     | 7       | 1,137     | 70            | 8,026     | 229,793             | 39,439      | 120                                                | 4,221                                             |  |
| 39 South Carolina.....        | 40                  | 198,344         | 94,301       | 283     | 3,479     | 31      | 2,910     | 61            | 2,207     | 54,429              | 9,803       | 44                                                 | 12,996                                            |  |
| 40 South Dakota.....          | 37                  | 199,583         | 58,844       | 620     | 6,564     | 22      | 1,545     | 20            | 4,499     | 40,622              | 6,595       | 51                                                 | 6,601                                             |  |
| 41 Tennessee.....             | 78                  | 334,236         | 108,251      | 146     | 1,996     | 10      | 690       | 87            | 3,112     | 148,624             | 28,881      |                                                    | 8,822                                             |  |
| 42 Texas.....                 | 218                 | 1,539,947       | 361,135      | 967     | 11,472    | 261     | 10,393    | 365           | 12,605    | 280,546             | 45,268      | 11,017                                             | 18,190                                            |  |
| 43 Utah.....                  | 31                  | 121,590         | 113,974      | 67      | 794       | 6       | 607       | 106           | 13,402    | 21,594              | 4,143       |                                                    | 4,436                                             |  |
| 44 Vermont.....               | 60                  | 177,966         | 118,071      | 121     | 2,409     | 15      | 1,882     | 73            | 4,150     | 104,822             | 17,149      | 1,510                                              | 21,906                                            |  |
| 45 Virginia.....              | 51                  | 105,558         | 54,188       | 161     | 1,978     |         |           | 111           | 3,568     | 31,679              | 5,919       | 52                                                 | 1,967                                             |  |
| 46 Washington.....            | 71                  | 736,722         | 575,637      | 507     | 6,083     | 6       | 370       | 45            | 4,399     | 248,954             | 36,539      | 2,284                                              | 35,352                                            |  |
| 47 West Virginia.....         | 48                  | 242,563         | 129,417      | 15      | 235       |         |           | 24            | 1,144     | 58,877              | 10,655      |                                                    | 1,908                                             |  |
| 48 Wisconsin.....             | 206                 | 819,153         | 334,984      | 599     | 7,156     | 68      | 2,998     | 93            | 3,430     | 285,048             | 49,520      | 1,461                                              | 31,261                                            |  |
| 49 Wyoming.....               | 18                  | 102,955         | 24,698       | 83      | 949       | 3       | 180       | 12            | 446       | 13,114              | 2,696       | 632                                                | 1,163                                             |  |
| 50 Alaska.....                | 9                   | 162,247         | 47,251       | 20      | 290       | 3       | 514       | 24            | 1,262     | 20,063              | 6,040       |                                                    | 3,203                                             |  |
| 51 Hawaii and Porto Rico..... | 6                   | 81,710          | 22,992       | 254     | 3,595     |         |           |               |           | 10,697              | 1,809       |                                                    | 455                                               |  |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## SUPPLIES, MATERIALS, AND FUEL, BY STATES AND TERRITORIES: 1907.

| SUPPLIES AND MATERIALS—continued.                                             |                                  |                        |                                                                                            |                  |                   |                                                               |                                            | COST OF FUEL. |              |                  |              |                   |                 |
|-------------------------------------------------------------------------------|----------------------------------|------------------------|--------------------------------------------------------------------------------------------|------------------|-------------------|---------------------------------------------------------------|--------------------------------------------|---------------|--------------|------------------|--------------|-------------------|-----------------|
| Carbons, globes, hoods, and other supplies for arc lamps, and repairs (cost). | Poles and other supports (cost). | Wire and cable (cost). | All other supplies and materials, including water for boilers, mill supplies, etc. (cost). | Power purchased. |                   | Rent of water privileges for water wheels or turbines (cost). | Freight not included in cost of materials. | Total.        | Coal.        | Crude petroleum. | Natural gas. | Manufactured gas. | All other fuel. |
|                                                                               |                                  |                        |                                                                                            | Electric (cost). | All other (cost). |                                                               |                                            |               |              |                  |              |                   |                 |
| \$1,698,205                                                                   | \$757,379                        | \$1,769,109            | \$4,436,728                                                                                | \$6,417,237      | \$657,235         | \$386,552                                                     | \$281,792                                  | \$23,057,745  | \$19,681,212 | \$2,171,547      | \$299,648    | \$194,816         | \$710,522       |
| 9,589                                                                         | 5,448                            | 12,424                 | 38,753                                                                                     | 7,148            | 2,500             | 900                                                           | 1,977                                      | 216,013       | 200,915      | 167,922          |              |                   | 15,038          |
| 3,068                                                                         | 2,044                            | 6,359                  | 16,678                                                                                     | 2,580            | 8,870             | 2,500                                                         | 703                                        | 178,232       | 6,310        |                  |              |                   | 4,003           |
| 3,414                                                                         | 4,164                            | 6,385                  | 21,129                                                                                     | 689,170          | 4,783             | 46,158                                                        | 1,020                                      | 169,967       | 155,961      | 945,251          |              |                   | 14,036          |
| 80,704                                                                        | 112,749                          | 158,273                | 518,536                                                                                    | 116,336          |                   | 11,150                                                        | 5,428                                      | 1,122,639     |              |                  |              | 150,407           | 26,981          |
| 25,303                                                                        | 7,993                            | 27,606                 | 63,590                                                                                     |                  |                   |                                                               |                                            | 489,033       | 486,613      |                  |              |                   | 2,420           |
| 24,306                                                                        | 16,480                           | 25,760                 | 57,109                                                                                     | 38,078           | 5,650             | 15,518                                                        | 1,938                                      | 334,733       | 322,601      | 3,382            |              |                   | 8,750           |
| 13,911                                                                        | 14,703                           | 36,166                 | 11,781                                                                                     | 71,969           |                   |                                                               | 2,159                                      | 155,299       | 155,299      |                  |              |                   |                 |
| 6,728                                                                         | 2,145                            | 5,509                  | 19,034                                                                                     | 954              |                   |                                                               | 3,325                                      | 187,324       | 97,993       |                  |              |                   | 89,331          |
| 8,252                                                                         | 7,982                            | 13,293                 | 24,466                                                                                     | 26,974           |                   | 4,536                                                         |                                            | 166,641       | 118,427      |                  |              |                   | 48,214          |
| 3,774                                                                         | 3,919                            | 6,896                  | 15,546                                                                                     | 80,579           |                   | 89                                                            | 375                                        | 39,461        | 27,734       |                  |              |                   | 11,727          |
| 183,769                                                                       | 23,907                           | 168,542                | 209,287                                                                                    | 200,057          | 63,791            | 27,360                                                        | 21,460                                     | 2,006,053     | 1,997,418    | 3,300            | 1,800        |                   | 3,535           |
| 77,777                                                                        | 23,738                           | 79,267                 | 106,935                                                                                    | 12,684           | 14,725            | 2,765                                                         | 20,614                                     | 848,624       | 848,624      | 2,921            | 10,489       |                   | 1,401           |
| 20,223                                                                        | 10,768                           | 33,010                 | 77,703                                                                                     | 108,653          | 19,707            | 1,980                                                         | 20,115                                     | 533,438       | 531,169      | 336              |              |                   | 1,933           |
| 9,403                                                                         | 4,395                            | 9,512                  | 45,269                                                                                     | 31,538           | 10,928            | 1,200                                                         | 3,877                                      | 391,410       | 228,761      | 18,500           | 52,424       |                   | 1,725           |
| 24,428                                                                        | 3,343                            | 19,160                 | 75,638                                                                                     | 36,297           |                   |                                                               | 1,441                                      | 298,270       | 296,908      |                  |              |                   | 1,362           |
| 15,889                                                                        | 5,654                            | 19,582                 | 37,386                                                                                     | 70,427           | 4,700             | 1,258                                                         | 41                                         | 289,579       | 175,060      | 96,464           | 714          |                   | 17,341          |
| 16,415                                                                        | 4,531                            | 15,972                 | 30,055                                                                                     | 32,762           | 7,006             | 22,340                                                        | 2,287                                      | 116,689       | 109,333      | 555              |              |                   | 6,801           |
| 70,234                                                                        | 2,922                            | 7,753                  | 44,554                                                                                     | 6,035            |                   |                                                               | 494                                        | 325,158       | 320,263      |                  |              |                   | 4,895           |
| 76,167                                                                        | 61,268                           | 237,745                | 237,765                                                                                    | 282,715          | 12,727            | 78,097                                                        | 1,692                                      | 1,376,830     | 1,344,354    | 4,364            |              |                   | 28,112          |
| 60,151                                                                        | 15,562                           | 50,730                 | 104,604                                                                                    | 613,402          | 17,130            | 18,239                                                        | 15,936                                     | 852,734       | 826,949      |                  |              | 212               | 25,573          |
| 35,918                                                                        | 44,248                           | 30,472                 | 87,801                                                                                     | 177,381          | 24,126            | 39,643                                                        | 18,700                                     | 540,935       | 484,335      |                  |              | 12,691            | 43,909          |
| 4,644                                                                         | 1,408                            | 3,758                  | 15,242                                                                                     | 2,849            | 3,270             |                                                               | 540                                        | 167,733       | 151,801      |                  |              |                   | 15,932          |
| 49,429                                                                        | 37,820                           | 32,994                 | 103,499                                                                                    | 336,239          | 1,620             |                                                               | 18,065                                     | 767,710       | 685,117      | 62,099           | 15,220       |                   | 5,274           |
| 11,312                                                                        | 1,108                            | 13,089                 | 34,865                                                                                     | 195,185          | 11,489            | 5,250                                                         | 158                                        | 122,551       | 111,761      |                  |              |                   | 10,790          |
| 10,138                                                                        | 2,632                            | 15,522                 | 53,483                                                                                     | 5,579            | 2,349             | 5,172                                                         | 5,965                                      | 307,992       | 301,412      |                  |              |                   | 6,580           |
| 173                                                                           | 8,327                            | 7,075                  | 10,972                                                                                     | 15,000           |                   | 1,000                                                         |                                            | 15,867        | 8,192        |                  |              |                   | 7,675           |
| 8,627                                                                         | 4,294                            | 10,352                 | 25,922                                                                                     | 13,913           | 6,492             | 9,580                                                         | 2,222                                      | 142,251       | 130,328      | 4,496            |              |                   | 7,427           |
| 96,314                                                                        | 41,256                           | 101,082                | 167,749                                                                                    | 24,417           | 15,546            | 2,285                                                         | 6,162                                      | 1,002,471     | 994,119      | 1,610            |              | 60                | 6,682           |
| 808                                                                           | 711                              | 1,378                  | 10,267                                                                                     | 28,919           |                   | 2,220                                                         |                                            | 52,798        | 51,154       |                  |              |                   | 1,644           |
| 220,505                                                                       | 95,531                           | 189,572                | 608,975                                                                                    | 2,040,875        | 65,069            | 12,582                                                        | 7,836                                      | 3,002,261     | 2,980,946    | 1,982            | 7,006        | 7,648             | 4,679           |
| 5,648                                                                         | 1,922                            | 2,726                  | 18,197                                                                                     | 12,018           | 10,152            | 250                                                           | 356                                        | 134,064       | 117,374      |                  |              |                   | 16,090          |
| 2,783                                                                         | 1,919                            | 4,961                  | 12,052                                                                                     |                  |                   |                                                               | 4,233                                      | 182,404       | 179,498      |                  |              |                   | 2,906           |
| 102,400                                                                       | 28,623                           | 102,355                | 412,287                                                                                    | 14,645           | 6,360             | 3,010                                                         | 23,496                                     | 1,307,873     | 1,215,778    | 3,493            | 83,979       |                   | 4,623           |
| 10,016                                                                        | 2,954                            | 3,065                  | 24,813                                                                                     | 16,707           | 1,080             |                                                               | 422                                        | 288,253       | 257,777      |                  | 29,557       |                   | 919             |
| 8,794                                                                         | 9,241                            | 16,898                 | 44,720                                                                                     | 15,220           | 1,100             | 3,835                                                         | 3,479                                      | 173,588       | 7,470        | 82,780           |              |                   | 83,338          |
| 258,196                                                                       | 59,839                           | 102,183                | 647,407                                                                                    | 720,039          | 24,339            | 25,273                                                        | 35,914                                     | 1,975,553     | 1,899,829    | 3,607            | 67,923       | 15                | 4,179           |
| 24,567                                                                        | 8,918                            | 16,083                 | 42,646                                                                                     | 16,122           |                   |                                                               | 798                                        | 245,386       | 240,799      | 4,500            |              |                   | 87              |
| 6,055                                                                         | 6,371                            | 7,911                  | 18,305                                                                                     | 24,121           |                   |                                                               | 93                                         | 104,043       | 82,420       | 4,118            |              |                   | 17,505          |
| 2,616                                                                         | 3,822                            | 6,162                  | 8,820                                                                                      | 8,215            |                   |                                                               | 3,354                                      | 140,739       | 131,277      |                  | 1,135        |                   | 8,327           |
| 18,956                                                                        | 5,181                            | 5,668                  | 26,455                                                                                     | 1,495            | 5,245             | 400                                                           | 1,350                                      | 225,985       | 223,879      |                  |              |                   | 2,106           |
| 23,541                                                                        | 18,341                           | 50,332                 | 97,658                                                                                     | 27,792           | 5,241             | 3,220                                                         | 26,065                                     | 1,178,812     | 407,216      | 728,343          |              |                   | 43,253          |
| 1,305                                                                         | 5,219                            | 7,361                  | 26,528                                                                                     | 48,916           |                   | 300                                                           | 963                                        | 7,616         | 7,606        |                  |              |                   | 10              |
| 5,371                                                                         | 4,142                            | 14,166                 | 14,742                                                                                     | 12,785           | 11,070            | 5,895                                                         | 899                                        | 57,884        | 57,884       |                  |              |                   | 2,011           |
| 3,813                                                                         | 1,335                            | 6,679                  | 11,721                                                                                     | 10,097           | 2,400             | 2,150                                                         | 2,503                                      | 51,370        | 49,968       |                  |              |                   | 1,402           |
| 18,087                                                                        | 13,357                           | 33,161                 | 50,912                                                                                     | 109,252          | 255,859           | 9,887                                                         | 95                                         | 161,085       | 84,968       | 31,124           |              |                   | 44,993          |
| 11,760                                                                        | 1,767                            | 2,469                  | 24,846                                                                                     | 69,266           |                   | 1,650                                                         | 3,717                                      | 113,146       | 83,745       |                  | 29,401       |                   | 47              |
| 21,049                                                                        | 12,038                           | 37,803                 | 69,194                                                                                     | 40,014           | 34,411            | 18,255                                                        | 6,365                                      | 494,189       | 405,610      | 400              |              | 23,783            | 54,376          |
| 1,875                                                                         | 1,340                            | 3,258                  | 10,766                                                                                     | 1,218            |                   |                                                               | 175                                        | 78,257        | 78,257       |                  |              |                   | 49              |
| 506                                                                           | 1,395                            | 4,099                  | 10,863                                                                                     |                  |                   | 750                                                           | 18,359                                     | 114,996       | 13,000       | 14,770           |              |                   | 87,220          |
| 1,104                                                                         | 1,009                            | 883                    | 3,258                                                                                      |                  |                   | 579                                                           | 10,300                                     | 58,718        | 32,652       | 26,066           |              |                   |                 |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 122.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF INCOME, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.        | Number of stations. | INCOME.       |                   |               |              |                    |                           |                                           |                   |                       |             |             | All other sources. |
|----------------------------|---------------------|---------------|-------------------|---------------|--------------|--------------------|---------------------------|-------------------------------------------|-------------------|-----------------------|-------------|-------------|--------------------|
|                            |                     | Gross income. | Electric service. |               |              |                    |                           |                                           |                   |                       |             |             |                    |
|                            |                     |               | Total.            | Lighting.     |              | Stationary motors. | Electric-railway service. | Current sold to other electric companies. | Electric heating. | Charging automobiles. | All other.  |             |                    |
|                            |                     |               |                   | Commercial.   | Public.      |                    |                           |                                           |                   |                       |             |             |                    |
| United States.....         | 4,714               | \$175,642,338 | \$169,614,091     | \$100,337,434 | \$25,417,680 | \$28,511,550       | \$7,841,497               | \$5,519,746                               | \$271,591         | \$154,747             | \$1,580,446 | \$6,027,647 |                    |
| Alabama.....               | 55                  | 1,012,743     | 997,506           | 687,569       | 139,525      | 84,805             | 60,583                    | 7,104                                     | 1,215             | 23,809                | 15,237      | 25,658      |                    |
| Arizona.....               | 15                  | 569,850       | 544,192           | 415,860       | 31,102       | 71,808             | 17,818                    | 18                                        | 18                | 500                   | 9,269       | 10,802      |                    |
| Arkansas.....              | 63                  | 675,718       | 664,916           | 510,286       | 110,020      | 18,248             | 17,075                    | 550,159                                   | 16,681            | 663                   | 20,316      | 494,501     |                    |
| California.....            | 129                 | 14,416,529    | 13,922,028        | 7,220,210     | 890,802      | 3,826,462          | 1,396,735                 | 154,412                                   | 954               | 78                    | 183         | 92,396      |                    |
| Colorado.....              | 56                  | 3,410,240     | 3,317,844         | 1,921,459     | 259,851      | 951,836            | 29,071                    | 122,973                                   | 626               | 1,279                 | 648         | 17,184      |                    |
| Connecticut.....           | 41                  | 2,469,543     | 2,452,359         | 1,465,952     | 406,981      | 407,577            | 46,323                    | 31,971                                    | 3,627             | 26,500                | 3,638       | 22,256      |                    |
| Delaware.....              | 14                  | 1,464,644     | 1,442,388         | 992,824       | 192,219      | 191,609            | 114,078                   | 4,383                                     | 577               | 2,786                 | 2,537       | 23,619      |                    |
| Florida.....               | 37                  | 654,251       | 630,632           | 500,650       | 106,842      | 16,220             | 13,263                    | 204,654                                   | 3,267             | 927                   | 3,868       | 23,909      |                    |
| Georgia.....               | 93                  | 1,110,510     | 1,086,601         | 514,211       | 217,641      | 132,964            | 12,600                    | 32,504                                    | 785               | 150                   | 2,010       | 26,906      |                    |
| Idaho.....                 | 42                  | 719,395       | 692,489           | 486,781       | 58,528       | 100,291            | 1,604,328                 | 148,605                                   | 77,407            | 8,547                 | 3,937       | 899,221     |                    |
| Illinois.....              | 383                 | 15,465,993    | 14,566,772        | 8,078,661     | 2,200,007    | 2,445,280          | 114,078                   | 41,703                                    | 34,346            | 1,676                 | 4,855       | 215,722     |                    |
| Indiana.....               | 200                 | 4,438,332     | 4,222,610         | 2,572,824     | 885,547      | 568,199            | 28,896                    | 577                                       | 5,151             | 2,786                 | 3,874       | 162,089     |                    |
| Iowa.....                  | 192                 | 2,479,969     | 2,317,880         | 1,572,784     | 442,610      | 261,202            | 224,224                   | 41,679                                    | 44,753            | 927                   | 12,068      | 95,776      |                    |
| Kansas.....                | 111                 | 1,514,867     | 1,419,091         | 865,072       | 227,081      | 224,224            | 16,627                    | 421                                       | 336               | 2                     | 17,941      | 23,255      |                    |
| Kentucky.....              | 83                  | 1,660,700     | 1,610,475         | 955,555       | 416,012      | 220,061            | 7,871                     | 29,454                                    | 37,301            | 3,021                 | 1,800       | 26,725      |                    |
| Louisiana.....             | 42                  | 1,852,383     | 1,829,128         | 1,242,420     | 331,459      | 228,680            | 29,454                    | 100                                       | 2,455             | 1,109                 | 3,207       | 146,742     |                    |
| Maine.....                 | 81                  | 1,453,016     | 1,324,648         | 739,226       | 231,017      | 284,627            | 7,114                     | 244,054                                   | 44,526            | 794                   | 24,496      | 321,563     |                    |
| Maryland.....              | 36                  | 1,883,084     | 1,856,359         | 1,193,476     | 304,810      | 349,059            | 288,638                   | 244,054                                   | 2,455             | 1,109                 | 3,207       | 146,742     |                    |
| Massachusetts.....         | 120                 | 10,749,240    | 10,602,498        | 6,315,999     | 2,227,328    | 1,519,708          | 277,115                   | 681,638                                   | 44,526            | 794                   | 24,496      | 321,563     |                    |
| Michigan.....              | 234                 | 6,072,010     | 5,750,447         | 2,958,391     | 890,406      | 873,081            | 536,622                   | 22,628                                    | 41,629            | 7,942                 | 3,353       | 20,336      |                    |
| Minnesota.....             | 171                 | 3,478,009     | 3,333,469         | 2,193,540     | 507,419      | 536,622            | 22,628                    | 41,629                                    | 7,942             | 3,353                 | 20,336      | 144,540     |                    |
| Mississippi.....           | 68                  | 686,700       | 667,543           | 501,394       | 120,565      | 26,133             | 2,849                     | 2,782                                     | 3,739             | 30                    | 16,790      | 92,659      |                    |
| Missouri.....              | 102                 | 5,805,828     | 5,083,795         | 3,578,819     | 537,590      | 985,596            | 477,784                   | 95,694                                    | 188,529           | 40,584                | 8,455       | 88,243      |                    |
| Montana.....               | 33                  | 2,469,131     | 2,376,472         | 1,041,909     | 108,433      | 963,669            | 57,112                    | 188,529                                   | 40,584            | 8,455                 | 2,707       | 3,800       |                    |
| Nebraska.....              | 98                  | 1,562,669     | 1,474,426         | 1,019,573     | 212,838      | 168,402            | 18,067                    | 40,584                                    | 8,455             | 2,707                 | 3,800       | 88,243      |                    |
| Nevada.....                | 9                   | 372,108       | 352,959           | 184,736       | 9,789        | 148,560            | 8,340                     | 1,444                                     | 90                | 86                    | 14,055      | 101,049     |                    |
| New Hampshire.....         | 56                  | 1,422,345     | 1,321,296         | 599,763       | 225,552      | 190,764            | 217,361                   | 73,610                                    | 105               | 1,173                 | 886         | 41,033      |                    |
| New Jersey.....            | 64                  | 5,952,378     | 5,910,745         | 3,700,803     | 1,423,063    | 682,028            | 95,991                    | 4,166                                     | 2,575             | 1,173                 | 886         | 41,033      |                    |
| New Mexico.....            | 15                  | 292,682       | 289,962           | 208,587       | 19,564       | 24,033             | 5,924                     | 28,919                                    | 940               | 25                    | 1,970       | 2,720       |                    |
| New York.....              | 314                 | 34,859,170    | 34,067,383        | 20,430,108    | 3,866,270    | 5,688,401          | 1,168,700                 | 1,579,357                                 | 4,210             | 91,911                | 1,238,366   | 791,787     |                    |
| North Carolina.....        | 71                  | 543,322       | 527,672           | 296,893       | 128,963      | 76,431             | 25,235                    | 70                                        | 200               | 55                    | 2,920       | 53,341      |                    |
| North Dakota.....          | 29                  | 533,383       | 480,042           | 366,589       | 55,122       | 40,794             | 10,362                    | 4,000                                     | 3,725             | 290                   | 38,075      | 169,017     |                    |
| Ohio.....                  | 272                 | 7,643,997     | 7,474,980         | 4,577,608     | 1,705,193    | 1,054,076          | 47,477                    | 48,476                                    | 4,000             | 1,000                 | 6,500       | 9,182       |                    |
| Oklahoma.....              | 72                  | 1,106,316     | 1,087,134         | 763,024       | 157,713      | 103,920            | 60,977                    | 12,446                                    | 2,530             | 1,852                 | 125,090     | 614,592     |                    |
| Oregon.....                | 61                  | 1,965,245     | 1,840,155         | 1,093,924     | 187,025      | 375,306            | 167,072                   | 273,315                                   | 30,637            | 3,496                 | 8,866       | 614,592     |                    |
| Pennsylvania.....          | 327                 | 16,015,392    | 15,400,800        | 8,790,425     | 3,291,177    | 2,101,320          | 901,564                   | 273,315                                   | 30,637            | 3,496                 | 8,866       | 614,592     |                    |
| Rhode Island.....          | 7                   | 1,724,659     | 1,627,190         | 833,091       | 424,430      | 302,513            | 62,982                    | 3,000                                     | 500               | 674                   | 97,469      | 35,829      |                    |
| South Carolina.....        | 40                  | 901,537       | 865,708           | 285,620       | 124,045      | 432,384            | 1,100                     | 22,557                                    | 907               | 1,053                 | 20,915      | 33,373      |                    |
| South Dakota.....          | 37                  | 513,682       | 492,767           | 310,843       | 69,120       | 110,651            | 69,964                    | 1,255                                     | 300               | 970                   | 123,481     | 37,909      |                    |
| Tennessee.....             | 78                  | 1,299,983     | 1,266,610         | 800,907       | 202,416      | 130,798            | 187,276                   | 208,587                                   | 182               | 115                   | 6,621       | 46,310      |                    |
| Texas.....                 | 218                 | 3,792,203     | 3,668,722         | 2,745,418     | 321,576      | 376,897            | 13,281                    | 9,570                                     | 115               | 1,211                 | 9,849       | 190,728     |                    |
| Utah.....                  | 31                  | 665,241       | 627,332           | 222,067       | 27,405       | 173,439            | 4,714                     | 72,434                                    | 1,865             | 37                    | 744         | 151,557     |                    |
| Vermont.....               | 90                  | 841,701       | 795,391           | 472,908       | 130,473      | 162,376            | 11,761                    | 100                                       | 100               | 100                   | 13,897      | 18,771      |                    |
| Virginia.....              | 51                  | 390,628       | 380,779           | 235,937       | 83,965       | 40,746             | 32,295                    | 1,979                                     | 764               | 175                   | 3,106       | 13,818      |                    |
| Washington.....            | 71                  | 3,410,542     | 3,219,814         | 1,838,208     | 239,948      | 531,818            | 143,183                   | 464,797                                   | 663               | 41                    | 1,156       | 190,728     |                    |
| West Virginia.....         | 48                  | 724,253       | 689,919           | 425,612       | 141,415      | 43,064             | 4,714                     | 72,434                                    | 1,865             | 37                    | 744         | 151,557     |                    |
| Wisconsin.....             | 206                 | 2,278,637     | 2,127,080         | 1,350,876     | 432,481      | 253,087            | 52,191                    | 35,799                                    | 1,865             | 37                    | 744         | 151,557     |                    |
| Wyoming.....               | 18                  | 317,580       | 303,683           | 258,480       | 33,342       | 11,761             | 32,295                    | 1,979                                     | 764               | 175                   | 3,106       | 13,818      |                    |
| Alaska.....                | 9                   | 416,103       | 397,332           | 276,514       | 10,833       | 109,985            | 32,295                    | 1,979                                     | 764               | 175                   | 3,106       | 13,818      |                    |
| Hawaii and Porto Rico..... | 6                   | 321,592       | 307,774           | 219,319       | 50,136       | 109,985            | 32,295                    | 1,979                                     | 764               | 175                   | 3,106       | 13,818      |                    |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

TABLE 123.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF SALARIED EMPLOYEES AND TOTAL SALARIES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.         | Number of stations. | TOTAL.  |              | GENERAL OFFICERS OF CORPORATION. |             | GENERAL MANAGERS, SUPERINTENDENTS, ETC. |             | CLERKS AND BOOK-KEEPERS. |             |
|-----------------------------|---------------------|---------|--------------|----------------------------------|-------------|-----------------------------------------|-------------|--------------------------|-------------|
|                             |                     | Number. | Salaries.    | Number.                          | Salaries.   | Number.                                 | Salaries.   | Number.                  | Salaries.   |
| United States.....          | 4,714               | 12,990  | \$11,733,787 | 1,761                            | \$2,202,028 | 4,357                                   | \$5,068,236 | 6,872                    | \$4,473,523 |
| Alabama.....                | 55                  | 109     | 82,498       | 11                               | 13,119      | 53                                      | 46,305      | 45                       | 23,074      |
| Arizona.....                | 15                  | 58      | 55,596       | 15                               | 13,311      | 21                                      | 29,854      | 22                       | 12,431      |
| Arkansas.....               | 63                  | 75      | 52,670       | 7                                | 3,089       | 42                                      | 37,161      | 26                       | 12,420      |
| California.....             | 129                 | 927     | 1,141,902    | 72                               | 144,098     | 222                                     | 403,821     | 633                      | 593,983     |
| Colorado.....               | 56                  | 220     | 220,340      | 34                               | 50,162      | 73                                      | 95,582      | 113                      | 74,596      |
| Connecticut.....            | 41                  | 170     | 166,759      | 54                               | 57,134      | 44                                      | 60,900      | 72                       | 48,725      |
| Delaware <sup>1</sup> ..... | 14                  | 96      | 84,244       | 11                               | 23,516      | 25                                      | 24,164      | 60                       | 36,564      |
| Florida.....                | 37                  | 71      | 47,064       | 6                                | 2,410       | 34                                      | 27,459      | 31                       | 17,195      |
| Georgia.....                | 93                  | 132     | 102,862      | 10                               | 10,690      | 90                                      | 78,013      | 32                       | 14,159      |
| Idaho.....                  | 42                  | 72      | 82,755       | 11                               | 20,955      | 29                                      | 41,174      | 32                       | 20,626      |
| Illinois.....               | 383                 | 1,034   | 982,854      | 109                              | 133,774     | 293                                     | 383,863     | 632                      | 465,217     |
| Indiana.....                | 200                 | 448     | 310,136      | 72                               | 65,696      | 187                                     | 154,848     | 189                      | 89,602      |
| Iowa.....                   | 192                 | 278     | 188,899      | 58                               | 39,741      | 115                                     | 104,785     | 105                      | 44,373      |
| Kansas.....                 | 111                 | 182     | 136,160      | 23                               | 19,905      | 93                                      | 85,754      | 66                       | 30,501      |
| Kentucky.....               | 83                  | 124     | 100,601      | 14                               | 23,356      | 54                                      | 54,030      | 56                       | 23,306      |
| Louisiana.....              | 42                  | 113     | 97,053       | 18                               | 24,652      | 39                                      | 39,697      | 56                       | 32,704      |
| Maine.....                  | 81                  | 157     | 96,761       | 37                               | 23,283      | 69                                      | 52,408      | 51                       | 23,070      |
| Maryland.....               | 36                  | 160     | 157,825      | 27                               | 47,122      | 34                                      | 48,473      | 99                       | 62,230      |
| Massachusetts.....          | 120                 | 655     | 689,496      | 122                              | 174,925     | 155                                     | 254,250     | 378                      | 260,321     |
| Michigan.....               | 234                 | 534     | 381,337      | 47                               | 49,496      | 229                                     | 214,480     | 278                      | 117,361     |
| Minnesota.....              | 171                 | 292     | 261,578      | 28                               | 37,613      | 140                                     | 157,483     | 124                      | 66,482      |
| Mississippi.....            | 68                  | 103     | 71,213       | 9                                | 9,082       | 60                                      | 48,640      | 34                       | 13,491      |
| Missouri.....               | 162                 | 482     | 447,578      | 45                               | 74,144      | 161                                     | 204,767     | 276                      | 168,667     |
| Montana.....                | 33                  | 122     | 175,087      | 23                               | 38,385      | 41                                      | 78,019      | 58                       | 58,683      |
| Nebraska.....               | 98                  | 119     | 104,250      | 18                               | 20,965      | 59                                      | 61,614      | 42                       | 21,651      |
| Nevada.....                 | 9                   | 23      | 27,071       | 1                                | 250         | 12                                      | 16,970      | 10                       | 9,851       |
| New Hampshire.....          | 56                  | 109     | 83,568       | 38                               | 24,619      | 34                                      | 38,772      | 37                       | 20,177      |
| New Jersey.....             | 64                  | 399     | 419,954      | 53                               | 111,866     | 84                                      | 118,299     | 262                      | 139,799     |
| New Mexico.....             | 15                  | 27      | 21,505       | 6                                | 2,799       | 15                                      | 14,230      | 6                        | 4,476       |
| New York.....               | 314                 | 1,879   | 1,775,526    | 191                              | 336,488     | 401                                     | 593,236     | 1,287                    | 815,802     |
| North Carolina.....         | 71                  | 72      | 50,937       | 8                                | 3,520       | 47                                      | 41,917      | 17                       | 5,500       |
| North Dakota.....           | 29                  | 49      | 43,205       | 8                                | 5,918       | 25                                      | 27,732      | 16                       | 9,555       |
| Ohio.....                   | 272                 | 660     | 517,401      | 85                               | 119,074     | 253                                     | 206,709     | 322                      | 191,618     |
| Oklahoma.....               | 72                  | 126     | 92,329       | 16                               | 13,656      | 55                                      | 50,363      | 55                       | 28,310      |
| Oregon.....                 | 61                  | 118     | 130,792      | 7                                | 16,950      | 46                                      | 61,277      | 65                       | 52,565      |
| Pennsylvania.....           | 327                 | 1,189   | 1,054,939    | 204                              | 196,516     | 347                                     | 437,924     | 638                      | 421,499     |
| Rhode Island.....           | 7                   | 73      | 102,077      | 6                                | 25,601      | 18                                      | 34,745      | 49                       | 41,731      |
| South Carolina.....         | 40                  | 93      | 67,958       | 18                               | 15,466      | 42                                      | 39,161      | 33                       | 13,331      |
| South Dakota.....           | 37                  | 56      | 55,710       | 9                                | 12,305      | 35                                      | 34,883      | 12                       | 8,522       |
| Tennessee.....              | 78                  | 121     | 93,568       | 11                               | 19,240      | 68                                      | 56,514      | 42                       | 17,804      |
| Texas.....                  | 218                 | 373     | 278,797      | 68                               | 61,184      | 132                                     | 124,942     | 178                      | 92,671      |
| Utah.....                   | 31                  | 61      | 55,356       | 5                                | 1,230       | 38                                      | 46,123      | 18                       | 8,003       |
| Vermont.....                | 60                  | 109     | 69,006       | 19                               | 8,680       | 47                                      | 40,255      | 43                       | 20,071      |
| Virginia.....               | 51                  | 66      | 38,207       | 11                               | 5,030       | 36                                      | 26,232      | 19                       | 6,945       |
| Washington.....             | 71                  | 221     | 247,647      | 26                               | 45,245      | 79                                      | 103,832     | 116                      | 98,570      |
| West Virginia.....          | 48                  | 83      | 49,785       | 24                               | 7,245       | 39                                      | 33,130      | 20                       | 9,410       |
| Wisconsin.....              | 206                 | 290     | 190,129      | 55                               | 44,073      | 128                                     | 106,316     | 107                      | 39,740      |
| Wyoming.....                | 18                  | 35      | 28,722       | 11                               | 5,440       | 14                                      | 17,140      | 10                       | 6,142       |
| Alaska.....                 | 9                   | 27      | 52,350       | 5                                | 10,680      | 16                                      | 32,500      | 6                        | 9,170       |
| Hawaii and Porto Rico.....  | 6                   | 30      | 32,091       | 5                                | 521         | 12                                      | 20,001      | 13                       | 11,569      |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 124.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.         | Number of stations. | TOTAL.          |              | FOREMEN.        |             | INSPECTORS.     |           | ENGINEERS.      |             | ALL OTHER EMPLOYEES (INCLUDING FIREMEN, DYNAMO AND SWITCHBOARD MEN, LINEMEN, MECHANICS, AND LAMP TRIMMERS). |              |
|-----------------------------|---------------------|-----------------|--------------|-----------------|-------------|-----------------|-----------|-----------------|-------------|-------------------------------------------------------------------------------------------------------------|--------------|
|                             |                     | Average number. | Wages.       | Average number. | Wages.      | Average number. | Wages.    | Average number. | Wages.      | Average number.                                                                                             | Wages.       |
| United States.....          | 4,714               | 34,642          | \$23,686,537 | 1,434           | \$1,527,494 | 894             | \$897,097 | 5,857           | \$4,453,378 | 26,457                                                                                                      | \$17,008,568 |
| Alabama.....                | 55                  | 234             | 126,035      | 9               | 6,970       | 4               | 2,989     | 62              | 34,840      | 159                                                                                                         | 81,236       |
| Arizona.....                | 15                  | 90              | 75,067       | 6               | 6,190       | 1               | 900       | 21              | 24,573      | 62                                                                                                          | 43,404       |
| Arkansas.....               | 63                  | 169             | 105,144      | 3               | 2,470       | 1               | 480       | 54              | 38,849      | 111                                                                                                         | 63,345       |
| California.....             | 129                 | 2,201           | 1,952,291    | 117             | 157,649     | 37              | 39,580    | 139             | 149,500     | 1,908                                                                                                       | 1,605,562    |
| Colorado.....               | 56                  | 698             | 554,705      | 41              | 52,914      | 6               | 6,360     | 88              | 77,389      | 563                                                                                                         | 418,042      |
| Connecticut.....            | 41                  | 575             | 362,893      | 29              | 31,112      | 12              | 8,876     | 79              | 72,511      | 455                                                                                                         | 250,394      |
| Delaware <sup>1</sup> ..... | 14                  | 258             | 178,454      | 7               | 7,368       | 9               | 6,690     | 31              | 25,206      | 211                                                                                                         | 139,190      |
| Florida.....                | 37                  | 194             | 109,636      | 4               | 3,782       | 6               | 4,387     | 47              | 31,014      | 137                                                                                                         | 79,463       |
| Georgia.....                | 93                  | 252             | 129,849      | 11              | 10,140      |                 |           | 66              | 38,057      | 175                                                                                                         | 81,652       |
| Idaho.....                  | 42                  | 116             | 88,370       | 11              | 10,530      | 4               | 2,500     | 22              | 16,526      | 79                                                                                                          | 58,814       |
| Illinois.....               | 383                 | 2,868           | 2,049,867    | 87              | 84,919      | 161             | 104,307   | 550             | 427,412     | 2,070                                                                                                       | 1,433,229    |
| Indiana.....                | 200                 | 1,170           | 659,127      | 32              | 26,214      | 20              | 15,248    | 279             | 196,620     | 839                                                                                                         | 431,045      |
| Iowa.....                   | 192                 | 577             | 338,965      | 26              | 21,516      | 4               | 2,915     | 231             | 154,722     | 316                                                                                                         | 179,125      |
| Kansas.....                 | 111                 | 385             | 238,336      | 13              | 11,224      | 6               | 4,296     | 146             | 99,573      | 220                                                                                                         | 123,243      |
| Kentucky.....               | 83                  | 461             | 201,103      | 13              | 10,405      | 2               | 1,200     | 108             | 72,027      | 338                                                                                                         | 117,471      |
| Louisiana.....              | 42                  | 428             | 285,929      | 7               | 8,400       | 10              | 9,240     | 58              | 45,772      | 353                                                                                                         | 222,517      |
| Maine.....                  | 81                  | 345             | 209,245      | 17              | 14,561      | 6               | 3,857     | 45              | 30,421      | 277                                                                                                         | 160,406      |
| Maryland.....               | 36                  | 510             | 21,969       | 23              | 21,969      | 19              | 18,240    | 62              | 49,706      | 406                                                                                                         | 249,070      |
| Massachusetts.....          | 120                 | 2,017           | 1,546,151    | 83              | 87,674      | 71              | 60,216    | 255             | 248,474     | 1,608                                                                                                       | 1,149,787    |
| Michigan.....               | 234                 | 1,226           | 745,476      | 63              | 56,634      | 29              | 19,991    | 291             | 181,283     | 843                                                                                                         | 487,568      |
| Minnesota.....              | 171                 | 770             | 494,200      | 28              | 21,030      | 17              | 15,842    | 191             | 140,879     | 534                                                                                                         | 316,449      |
| Mississippi.....            | 68                  | 185             | 90,220       | 7               | 7,380       |                 |           | 69              | 39,762      | 109                                                                                                         | 43,078       |
| Missouri.....               | 162                 | 1,318           | 859,062      | 55              | 58,066      | 53              | 39,903    | 180             | 127,234     | 1,030                                                                                                       | 633,839      |
| Montana.....                | 33                  | 197             | 185,681      | 17              | 25,740      | 5               | 4,390     | 31              | 31,657      | 144                                                                                                         | 123,894      |
| Nebraska.....               | 98                  | 285             | 209,177      | 7               | 6,720       | 7               | 5,400     | 82              | 58,425      | 189                                                                                                         | 138,632      |
| Nevada.....                 | 9                   | 55              | 50,193       | 5               | 6,750       |                 |           | 7               | 6,055       | 43                                                                                                          | 37,388       |
| New Hampshire.....          | 56                  | 313             | 203,181      | 13              | 12,186      | 2               | 1,560     | 31              | 28,327      | 267                                                                                                         | 161,108      |
| New Jersey.....             | 64                  | 1,360           | 950,552      | 30              | 28,369      | 33              | 21,477    | 153             | 138,518     | 1,144                                                                                                       | 762,188      |
| New Mexico.....             | 15                  | 56              | 45,476       | 3               | 3,480       |                 |           | 17              | 17,028      | 36                                                                                                          | 24,968       |
| New York.....               | 314                 | 5,837           | 4,044,091    | 252             | 306,089     | 160             | 132,552   | 438             | 376,198     | 4,987                                                                                                       | 3,229,252    |
| North Carolina.....         | 71                  | 176             | 80,076       | 5               | 3,750       |                 |           | 45              | 24,372      | 126                                                                                                         | 51,954       |
| North Dakota.....           | 29                  | 101             | 70,178       | 4               | 4,400       | 1               | 720       | 41              | 32,013      | 55                                                                                                          | 33,045       |
| Ohio.....                   | 272                 | 1,497           | 1,026,524    | 55              | 55,000      | 54              | 42,790    | 405             | 304,875     | 963                                                                                                         | 623,859      |
| Oklahoma.....               | 72                  | 238             | 172,275      | 13              | 10,695      | 2               | 1,166     | 107             | 76,255      | 166                                                                                                         | 84,159       |
| Oregon.....                 | 61                  | 349             | 285,632      | 26              | 27,510      | 7               | 6,487     | 55              | 49,558      | 261                                                                                                         | 202,077      |
| Pennsylvania.....           | 327                 | 3,313           | 2,186,482    | 134             | 145,263     | 93              | 73,049    | 498             | 389,427     | 2,588                                                                                                       | 1,578,743    |
| Rhode Island.....           | 7                   | 377             | 248,528      | 12              | 13,360      | 11              | 9,614     | 13              | 13,414      | 341                                                                                                         | 212,140      |
| South Carolina.....         | 40                  | 168             | 77,399       | 11              | 6,588       | 3               | 1,590     | 35              | 21,055      | 119                                                                                                         | 48,166       |
| South Dakota.....           | 37                  | 113             | 71,433       | 5               | 2,576       |                 |           | 41              | 27,371      | 67                                                                                                          | 41,486       |
| Tennessee.....              | 78                  | 295             | 154,206      | 6               | 4,900       | 7               | 5,750     | 79              | 49,530      | 203                                                                                                         | 94,026       |
| Texas.....                  | 218                 | 897             | 510,422      | 35              | 30,940      | 8               | 5,227     | 276             | 177,864     | 578                                                                                                         | 296,391      |
| Utah.....                   | 31                  | 137             | 104,330      | 3               | 2,460       | 1               | 960       | 16              | 12,178      | 117                                                                                                         | 88,732       |
| Vermont.....                | 60                  | 188             | 119,774      | 17              | 14,289      | 5               | 3,419     | 28              | 20,803      | 138                                                                                                         | 81,263       |
| Virginia.....               | 51                  | 112             | 60,853       | 3               | 1,715       | 2               | 1,540     | 43              | 26,090      | 64                                                                                                          | 31,506       |
| Washington.....             | 71                  | 664             | 552,794      | 50              | 62,890      | 4               | 4,080     | 70              | 65,783      | 540                                                                                                         | 420,041      |
| West Virginia.....          | 48                  | 179             | 118,848      | 7               | 5,240       |                 |           | 64              | 48,552      | 108                                                                                                         | 65,056       |
| Wisconsin.....              | 206                 | 577             | 350,920      | 26              | 24,207      | 11              | 7,309     | 190             | 128,088     | 350                                                                                                         | 191,316      |
| Wyoming.....                | 18                  | 61              | 49,089       | 3               | 3,240       |                 |           | 18              | 17,592      | 40                                                                                                          | 28,257       |
| Alaska.....                 | 9                   | 49              | 79,021       | 4               | 9,120       | 1               | 1,800     | 16              | 25,085      | 28                                                                                                          | 43,016       |
| Hawaii and Porto Rico.....  | 6                   | 80              | 53,418       | 3               | 3,600       | 4               | 3,380     | 6               | 8,770       | 67                                                                                                          | 37,668       |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.



## GENERAL TABLES.

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TABLE 125.—COMMERCIAL AND MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF MISCELLANEOUS EXPENSES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.         | Number of stations. | Total expenses. | Rent of stations, line-wire supports, conduits, etc. | Rent of offices. | Taxes.      | Injuries and damages. | Insurance.  | Ordinary repairs of buildings and machinery. | All other expenses. |
|-----------------------------|---------------------|-----------------|------------------------------------------------------|------------------|-------------|-----------------------|-------------|----------------------------------------------|---------------------|
| United States.....          | 4,714               | \$26,326,257    | \$2,322,753                                          | \$577,193        | \$6,351,020 | \$634,991             | \$1,578,205 | \$4,300,664                                  | \$10,561,411        |
| Alabama.....                | 55                  | 138,653         | 151                                                  | 8,873            | 34,704      | 1,648                 | 14,418      | 24,852                                       | 54,007              |
| Arizona.....                | 15                  | 52,463          | 840                                                  | 3,185            | 13,749      | 1,623                 | 4,022       | 11,429                                       | 17,615              |
| Arkansas.....               | 63                  | 57,155          | 2,060                                                | 1,634            | 7,195       | 3,050                 | 9,034       | 16,188                                       | 17,994              |
| California.....             | 129                 | 2,200,322       | 2,890                                                | 58,477           | 491,455     | 26,399                | 83,735      | 470,693                                      | 1,066,673           |
| Colorado.....               | 56                  | 552,541         | 5,893                                                | 25,361           | 120,656     | 10,363                | 38,420      | 81,399                                       | 270,449             |
| Connecticut.....            | 41                  | 311,303         | 719                                                  | 6,553            | 44,177      | 5,528                 | 18,112      | 80,662                                       | 155,582             |
| Delaware <sup>1</sup> ..... | 14                  | 260,370         | 2,910                                                | 59,175           | 6,946       | 8,196                 | 65,781      | 117,362                                      | 117,362             |
| Florida.....                | 37                  | 35,170          | 1,606                                                | 6,248            | 600         | 8,176                 | 7,934       | 10,606                                       | 10,606              |
| Georgia.....                | 93                  | 106,866         | 4,000                                                | 4,622            | 19,038      | 834                   | 7,266       | 15,732                                       | 55,374              |
| Idaho.....                  | 42                  | 67,368          | 5,928                                                | 5,536            | 11,042      | 588                   | 2,821       | 6,084                                        | 55,369              |
| Illinois.....               | 383                 | 1,837,333       | 48,400                                               | 57,079           | 545,268     | 87,743                | 136,228     | 353,001                                      | 609,614             |
| Indiana.....                | 200                 | 553,972         | 1,427                                                | 20,994           | 111,996     | 11,509                | 43,506      | 183,763                                      | 180,777             |
| Iowa.....                   | 192                 | 253,477         | 909                                                  | 12,604           | 49,744      | 9,529                 | 28,212      | 52,998                                       | 99,481              |
| Kansas.....                 | 111                 | 179,608         | 817                                                  | 8,498            | 33,150      | 3,232                 | 15,656      | 36,126                                       | 82,129              |
| Kentucky.....               | 83                  | 206,330         | 630                                                  | 4,190            | 81,982      | 5,994                 | 18,888      | 41,060                                       | 55,586              |
| Louisiana.....              | 42                  | 320,972         | 4,266                                                | 105,969          | 11,745      | 13,462                | 35,269      | 150,261                                      | 150,261             |
| Maine.....                  | 81                  | 221,953         | 104                                                  | 4,314            | 46,673      | 8,318                 | 15,924      | 29,180                                       | 117,440             |
| Maryland.....               | 36                  | 473,646         | 93,817                                               | 11,036           | 73,338      | 21,153                | 25,638      | 53,361                                       | 196,803             |
| Massachusetts.....          | 120                 | 1,758,405       | 32,712                                               | 26,590           | 677,385     | 13,176                | 146,045     | 291,739                                      | 570,758             |
| Michigan.....               | 234                 | 684,009         | 69,660                                               | 13,641           | 168,044     | 10,397                | 33,905      | 144,758                                      | 243,404             |
| Minnesota.....              | 171                 | 382,796         | 2,654                                                | 13,592           | 136,595     | 11,866                | 28,953      | 78,736                                       | 110,400             |
| Mississippi.....            | 68                  | 64,942          | 120                                                  | 1,175            | 8,941       | 14,913                | 9,459       | 15,509                                       | 14,825              |
| Missouri.....               | 162                 | 963,146         | 16,525                                               | 22,500           | 246,371     | 27,096                | 57,662      | 157,553                                      | 435,409             |
| Montana.....                | 33                  | 318,818         | 1,354                                                | 10,667           | 78,076      | 7,109                 | 7,390       | 20,558                                       | 193,664             |
| Nebraska.....               | 98                  | 179,150         | 240                                                  | 7,265            | 55,217      | 2,847                 | 15,417      | 41,669                                       | 56,495              |
| Nevada.....                 | 9                   | 54,760          | 12,620                                               | 4,130            | 11,558      | 56                    | 6,493       | 6,142                                        | 13,761              |
| New Hampshire.....          | 56                  | 163,037         | 309                                                  | 5,994            | 39,117      | 2,505                 | 20,920      | 34,663                                       | 59,329              |
| New Jersey.....             | 64                  | 637,277         | 4,951                                                | 21,542           | 207,413     | 20,934                | 47,330      | 111,566                                      | 223,541             |
| New Mexico.....             | 15                  | 40,436          | 1,004                                                | 6,682            | 409         | 2,356                 | 6,760       | 23,225                                       | 23,225              |
| New York.....               | 314                 | 6,678,242       | 1,212,567                                            | 75,822           | 1,580,259   | 179,944               | 322,333     | 807,796                                      | 2,499,521           |
| North Carolina.....         | 71                  | 42,350          | 300                                                  | 1,573            | 5,665       | 1,210                 | 5,564       | 9,587                                        | 18,451              |
| North Dakota.....           | 29                  | 39,631          | 492                                                  | 1,436            | 9,589       | 952                   | 3,699       | 13,163                                       | 10,300              |
| Ohio.....                   | 272                 | 1,615,290       | 617,723                                              | 21,959           | 276,431     | 37,548                | 42,362      | 204,127                                      | 415,140             |
| Oklahoma.....               | 72                  | 166,945         | 1,470                                                | 6,429            | 15,893      | 2,018                 | 14,301      | 24,865                                       | 101,969             |
| Oregon.....                 | 61                  | 197,865         | 120                                                  | 6,305            | 62,864      | 1,007                 | 10,419      | 50,532                                       | 66,618              |
| Pennsylvania.....           | 327                 | 2,332,755       | 142,654                                              | 37,910           | 421,572     | 29,093                | 145,751     | 327,271                                      | 1,228,504           |
| Rhode Island.....           | 7                   | 229,212         | 154                                                  | 5,700            | 100,028     | 1,241                 | 27,886      | 15,455                                       | 78,748              |
| South Carolina.....         | 40                  | 167,785         | 17,012                                               | 2,411            | 21,016      | 713                   | 5,998       | 21,938                                       | 98,697              |
| South Dakota.....           | 37                  | 32,360          | 1,764                                                | 6,962            | 230         | 3,671                 | 6,324       | 13,409                                       | 13,409              |
| Tennessee.....              | 78                  | 154,964         | 1,420                                                | 3,683            | 29,886      | 3,943                 | 11,223      | 45,812                                       | 58,997              |
| Texas.....                  | 218                 | 571,722         | 700                                                  | 12,308           | 98,895      | 31,465                | 37,253      | 102,055                                      | 289,046             |
| Utah.....                   | 31                  | 71,832          | 3,000                                                | 3,522            | 22,780      | 2,100                 | 276         | 8,917                                        | 31,237              |
| Vermont.....                | 60                  | 154,397         | 2,053                                                | 4,635            | 17,936      | 33                    | 12,850      | 35,756                                       | 81,134              |
| Virginia.....               | 51                  | 33,587          | 257                                                  | 3,629            | 5,708       | 1,448                 | 4,732       | 4,066                                        | 13,747              |
| Washington.....             | 71                  | 374,528         | 3,701                                                | 6,355            | 106,224     | 4,836                 | 19,779      | 65,110                                       | 166,523             |
| West Virginia.....          | 48                  | 67,815          | 960                                                  | 2,253            | 11,814      | 4,400                 | 7,979       | 19,416                                       | 20,993              |
| Wisconsin.....              | 206                 | 281,692         | 8,740                                                | 7,992            | 57,168      | 4,236                 | 31,432      | 52,611                                       | 119,513             |
| Wyoming.....                | 18                  | 35,007          | 1,669                                                | 1,669            | 7,372       | 464                   | 3,023       | 10,718                                       | 11,761              |
| Alaska.....                 | 9                   | 29,192          | 480                                                  | 3,583            | 720         | 5,671                 | 18,738      | 18,738                                       | 18,738              |
| Hawaii and Porto Rico.....  | 6                   | 41,182          | 235                                                  | 3,300            | 11,433      | 1,965                 | 6,866       | 17,383                                       | 17,383              |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 126.—COMMERCIAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER

| 1  | STATE OR TERRITORY.                      | Number of stations. | PRIMARY POWER. |              |                |           |                      |              |                                      |              |                                   |              |                                   |              |                       |              |
|----|------------------------------------------|---------------------|----------------|--------------|----------------|-----------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-----------------------------------|--------------|-----------------------|--------------|
|    |                                          |                     | Aggregate.     |              | Steam engines. |           |                      |              |                                      |              |                                   |              |                                   |              |                       |              |
|    |                                          |                     |                |              | Total.         |           | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              | 2,000 H. P. but under 5,000 H. P. |              | 5,000 H. P. and over. |              |
|    |                                          |                     | Num-ber.       | Horse-power. |                |           | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.              | Horse-power. |
| 1  | United States.....                       | 3,462               | 8,981          | 3,776,837    | 5,144          | 1,546,007 | 4,535                | 781,673      | 342                                  | 236,638      | 178                               | 225,916      | 70                                | 186,280      | 19                    | 115,500      |
| 2  | Alabama.....                             | 27                  | 67             | 21,866       | 45             | 12,629    | 38                   | 6,299        | 4                                    | 2,430        | 3                                 | 3,900        |                                   |              |                       |              |
| 3  | Arizona.....                             | 15                  | 39             | 7,746        | 25             | 4,286     | 25                   | 4,286        |                                      |              |                                   |              |                                   |              |                       |              |
| 4  | Arkansas.....                            | 50                  | 82             | 11,044       | 71             | 9,182     | 71                   | 9,182        |                                      |              |                                   |              |                                   |              |                       |              |
| 5  | California.....                          | 115                 | 362            | 379,443      | 124            | 94,049    | 88                   | 19,219       | 15                                   | 10,405       | 5                                 | 6,025        | 11                                | 23,900       | 5                     | 34,500       |
| 6  | Colorado.....                            | 49                  | 183            | 81,457       | 88             | 31,865    | 66                   | 10,982       | 13                                   | 9,883        | 7                                 | 7,000        | 2                                 | 4,000        |                       |              |
| 7  | Connecticut.....                         | 36                  | 163            | 51,653       | 86             | 20,542    | 83                   | 18,092       | 3                                    | 2,450        |                                   |              |                                   |              |                       |              |
| 8  | Delaware <sup>1</sup> .....              | 8                   | 43             | 32,465       | 17             | 7,175     | 12                   | 2,975        | 5                                    | 4,200        |                                   |              |                                   |              |                       |              |
| 9  | Florida.....                             | 24                  | 40             | 6,401        | 37             | 6,188     | 37                   | 6,188        |                                      |              |                                   |              |                                   |              |                       |              |
| 10 | Georgia.....                             | 34                  | 71             | 44,740       | 33             | 6,345     | 32                   | 5,095        |                                      |              | 1                                 | 1,250        |                                   |              |                       |              |
| 11 | Idaho.....                               | 40                  | 54             | 13,409       | 18             | 2,117     | 18                   | 2,117        |                                      |              |                                   |              |                                   |              |                       |              |
| 12 | Illinois.....                            | 271                 | 649            | 268,399      | 486            | 117,721   | 445                  | 66,871       | 19                                   | 13,750       | 18                                | 23,100       | 3                                 | 9,000        | 1                     | 5,000        |
| 13 | Indiana.....                             | 132                 | 367            | 96,382       | 230            | 50,856    | 213                  | 37,356       | 14                                   | 9,000        | 3                                 | 4,500        |                                   |              |                       |              |
| 14 | Iowa.....                                | 141                 | 259            | 36,928       | 196            | 31,168    | 189                  | 25,613       | 5                                    | 2,857        | 2                                 | 2,698        |                                   |              |                       |              |
| 15 | Kansas.....                              | 79                  | 172            | 40,853       | 103            | 28,680    | 95                   | 15,260       | 4                                    | 3,000        | 1                                 | 1,420        | 3                                 | 9,000        |                       |              |
| 16 | Kentucky.....                            | 69                  | 135            | 37,400       | 121            | 27,955    | 106                  | 16,355       | 12                                   | 7,800        | 3                                 | 3,800        |                                   |              |                       |              |
| 17 | Louisiana.....                           | 21                  | 54             | 19,005       | 34             | 16,255    | 24                   | 4,390        | 4                                    | 2,875        | 4                                 | 5,000        | 2                                 | 4,000        |                       |              |
| 18 | Maine.....                               | 77                  | 206            | 55,635       | 73             | 15,793    | 72                   | 15,193       | 1                                    | 600          |                                   |              |                                   |              |                       |              |
| 19 | Maryland.....                            | 28                  | 95             | 49,086       | 68             | 36,725    | 58                   | 10,575       | 4                                    | 2,650        | 1                                 | 1,000        | 4                                 | 15,000       | 1                     | 7,600        |
| 20 | Massachusetts.....                       | 96                  | 333            | 172,530      | 239            | 108,445   | 178                  | 38,339       | 38                                   | 27,456       | 12                                | 15,400       | 11                                | 27,250       |                       |              |
| 21 | Michigan.....                            | 130                 | 404            | 152,703      | 141            | 33,840    | 129                  | 23,757       | 9                                    | 6,350        | 3                                 | 3,733        |                                   |              |                       |              |
| 22 | Minnesota.....                           | 79                  | 203            | 104,500      | 98             | 24,730    | 85                   | 12,390       | 8                                    | 5,200        | 4                                 | 5,150        | 1                                 | 2,000        |                       |              |
| 23 | Mississippi.....                         | 29                  | 44             | 7,355        | 39             | 6,115     | 39                   | 6,115        |                                      |              |                                   |              |                                   |              |                       |              |
| 24 | Missouri.....                            | 104                 | 303            | 99,370       | 154            | 51,367    | 135                  | 20,577       | 6                                    | 4,030        | 6                                 | 6,630        | 7                                 | 20,130       |                       |              |
| 25 | Montana.....                             | 31                  | 91             | 68,467       | 26             | 5,455     | 24                   | 3,455        |                                      |              | 2                                 | 2,000        |                                   |              |                       |              |
| 26 | Nebraska.....                            | 73                  | 132            | 25,789       | 81             | 12,704    | 79                   | 10,754       | 1                                    | 750          | 1                                 | 1,200        |                                   |              |                       |              |
| 27 | Nevada.....                              | 9                   | 19             | 6,980        | 3              | 210       | 3                    | 210          |                                      |              |                                   |              |                                   |              |                       |              |
| 28 | New Hampshire.....                       | 52                  | 159            | 45,869       | 35             | 14,560    | 30                   | 6,860        | 1                                    | 700          | 3                                 | 4,000        | 1                                 | 3,000        |                       |              |
| 29 | New Jersey.....                          | 57                  | 245            | 91,905       | 175            | 74,563    | 122                  | 26,735       | 31                                   | 21,050       | 22                                | 26,778       |                                   |              |                       |              |
| 30 | New Mexico.....                          | 15                  | 32             | 4,548        | 26             | 4,035     | 25                   | 3,185        | 1                                    | 850          |                                   |              |                                   |              |                       |              |
| 31 | New York.....                            | 267                 | 881            | 709,914      | 409            | 197,204   | 338                  | 62,004       | 33                                   | 23,400       | 17                                | 22,000       | 10                                | 29,300       | 11                    | 60,500       |
| 32 | North Carolina.....                      | 35                  | 62             | 13,908       | 28             | 3,907     | 27                   | 3,307        | 1                                    | 600          |                                   |              |                                   |              |                       |              |
| 33 | North Dakota.....                        | 21                  | 48             | 8,852        | 42             | 8,395     | 41                   | 7,745        | 1                                    | 650          |                                   |              |                                   |              |                       |              |
| 34 | Ohio.....                                | 167                 | 401            | 149,684      | 292            | 99,857    | 250                  | 42,838       | 20                                   | 12,937       | 12                                | 16,882       | 10                                | 27,200       |                       |              |
| 35 | Oklahoma.....                            | 58                  | 96             | 20,428       | 92             | 19,404    | 88                   | 15,964       | 3                                    | 1,940        | 1                                 | 1,500        |                                   |              |                       |              |
| 36 | Oregon.....                              | 50                  | 134            | 126,211      | 52             | 19,730    | 39                   | 7,530        | 6                                    | 3,800        | 7                                 | 8,400        |                                   |              |                       |              |
| 37 | Pennsylvania.....                        | 282                 | 865            | 288,996      | 589            | 196,552   | 513                  | 112,527      | 43                                   | 29,425       | 29                                | 38,600       | 3                                 | 8,000        | 1                     | 8,000        |
| 38 | Rhode Island.....                        | 6                   | 65             | 27,886       | 21             | 12,390    | 10                   | 2,920        | 9                                    | 6,460        | 2                                 | 3,000        |                                   |              |                       |              |
| 39 | South Carolina.....                      | 23                  | 83             | 81,510       | 27             | 5,870     | 26                   | 3,370        |                                      |              |                                   |              | 1                                 | 2,500        |                       |              |
| 40 | South Dakota.....                        | 29                  | 59             | 11,216       | 30             | 4,442     | 30                   | 4,442        |                                      |              |                                   |              |                                   |              |                       |              |
| 41 | Tennessee.....                           | 50                  | 93             | 21,910       | 66             | 14,570    | 61                   | 8,570        | 1                                    | 600          | 3                                 | 3,400        | 1                                 | 2,000        |                       |              |
| 42 | Texas.....                               | 209                 | 401            | 68,974       | 274            | 46,351    | 256                  | 30,801       | 14                                   | 10,300       | 4                                 | 5,250        |                                   |              |                       |              |
| 43 | Utah.....                                | 22                  | 44             | 33,230       | 8              | 1,069     | 8                    | 1,069        |                                      |              |                                   |              |                                   |              |                       |              |
| 44 | Vermont.....                             | 47                  | 124            | 33,618       | 30             | 7,491     | 27                   | 5,641        | 3                                    | 1,850        |                                   |              |                                   |              |                       |              |
| 45 | Virginia.....                            | 37                  | 67             | 10,760       | 29             | 3,462     | 29                   | 3,462        |                                      |              |                                   |              |                                   |              |                       |              |
| 46 | Washington.....                          | 65                  | 107            | 61,815       | 47             | 9,149     | 44                   | 6,499        | 2                                    | 1,350        | 1                                 | 1,300        |                                   |              |                       |              |
| 47 | West Virginia.....                       | 43                  | 88             | 19,853       | 58             | 12,236    | 54                   | 9,436        | 3                                    | 1,800        | 1                                 | 1,000        |                                   |              |                       |              |
| 48 | Wisconsin.....                           | 142                 | 315            | 49,019       | 149            | 24,298    | 144                  | 21,068       | 5                                    | 3,240        |                                   |              |                                   |              |                       |              |
| 49 | Wyoming.....                             | 18                  | 40             | 5,125        | 29             | 4,085     | 29                   | 4,085        |                                      |              |                                   |              |                                   |              |                       |              |
| 50 | Alaska.....                              | 9                   | 26             | 4,741        | 14             | 2,231     | 14                   | 2,231        |                                      |              |                                   |              |                                   |              |                       |              |
| 51 | Hawaii and Porto Rico <sup>1</sup> ..... | 6                   | 22             | 4,416        | 13             | 3,190     | 13                   | 3,190        |                                      |              |                                   |              |                                   |              |                       |              |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907.

| PRIMARY POWER—continued. |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              |
|--------------------------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-----------------------------------|--------------|-----------------------|---------------|----------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|
| Steam turbines.          |              |                      |              |                                      |              |                                   |              |                                   |              |                       | Water wheels. |          |              |                      |              |                                      |              |                                   |              |
| Total.                   |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              | 2,000 H. P. but under 5,000 H. P. |              | 5,000 H. P. and over. |               | Total.   |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              |
| Num-ber.                 | Horse-power. | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.              | Horse-power.  | Num-ber. | Horse-power. | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. |
| 348                      | 798,025      | 49                   | 12,532       | 118                                  | 82,180       | 61                                | 80,272       | 76                                | 216,115      | 44                    | 406,926       | 2,328    | 1,318,740    | 1,761                | 296,689      | 243                                  | 160,251      | 160                               | 195,420      |
| 4                        | 2,392        | 1                    | 225          | 3                                    | 2,167        |                                   |              |                                   |              |                       |               | 13       | 6,675        | 9                    | 675          |                                      |              | 4                                 | 6,000        |
| 5                        | 2,550        | 3                    | 1,000        | 2                                    | 1,550        |                                   |              |                                   |              |                       |               | 4        | 750          | 4                    | 750          |                                      |              |                                   |              |
| 2                        | 1,225        |                      |              | 2                                    | 1,225        |                                   |              |                                   |              |                       |               | 1        | 300          | 1                    | 300          |                                      |              |                                   |              |
| 12                       | 34,250       | 1                    | 390          | 1                                    | 750          | 2                                 | 2,500        | 6                                 | 16,610       | 2                     | 14,000        | 171      | 208,244      | 79                   | 17,319       | 18                                   | 14,225       | 35                                | 41,400       |
| 13                       | 22,166       | 1                    | 225          | 3                                    | 2,041        | 4                                 | 5,500        | 5                                 | 14,400       |                       |               | 47       | 25,580       | 32                   | 5,480        | 6                                    | 3,900        | 6                                 | 6,600        |
| 12                       | 12,886       | 3                    | 950          | 3                                    | 2,036        | 6                                 | 9,900        |                                   |              |                       |               | 52       | 17,955       | 46                   | 7,955        |                                      |              | 6                                 | 10,000       |
| 8                        | 23,800       | 2                    | 1,000        | 1                                    | 800          | 1                                 | 1,000        | 2                                 | 6,000        | 2                     | 15,000        | 5        | 285          | 5                    | 285          |                                      |              |                                   |              |
| 2                        | 210          | 2                    | 210          |                                      |              |                                   |              |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              |
| 1                        | 2,000        |                      |              |                                      |              |                                   |              | 1                                 | 2,000        |                       |               | 35       | 36,155       | 13                   | 2,155        | 4                                    | 3,000        | 11                                | 14,200       |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 36       | 11,292       | 33                   | 8,542        | 1                                    | 750          | 2                                 | 2,000        |
| 27                       | 138,710      |                      |              | 10                                   | 6,710        | 4                                 | 5,300        | 3                                 | 10,200       | 10                    | 116,500       | 80       | 10,478       | 80                   | 10,478       |                                      |              |                                   |              |
| 22                       | 23,861       | 3                    | 187          | 10                                   | 7,324        | 4                                 | 4,650        | 5                                 | 11,700       |                       |               | 77       | 19,075       | 77                   | 19,075       |                                      |              |                                   |              |
| 2                        | 1,500        |                      |              | 2                                    | 1,500        |                                   |              |                                   |              |                       |               | 41       | 3,478        | 41                   | 3,478        |                                      |              |                                   |              |
| 2                        | 1,500        |                      |              | 2                                    | 1,500        |                                   |              |                                   |              |                       |               | 35       | 8,461        | 35                   | 8,461        |                                      |              |                                   |              |
| 3                        | 9,125        | 1                    | 125          |                                      |              |                                   |              | 2                                 | 9,000        |                       |               |          |              |                      |              |                                      |              |                                   |              |
| 2                        | 1,825        |                      |              | 1                                    | 525          | 1                                 | 1,300        |                                   |              |                       |               |          |              |                      |              |                                      |              |                                   |              |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               | 124      | 38,021       | 95                   | 13,097       | 25                                   | 19,104       | 4                                 | 5,220        |
| 7                        | 10,866       | 2                    | 700          | 1                                    | 666          | 1                                 | 1,500        | 3                                 | 8,000        |                       |               | 13       | 1,347        | 13                   | 1,347        |                                      |              |                                   |              |
| 19                       | 46,930       | 2                    | 550          | 7                                    | 4,990        | 5                                 | 6,700        | 2                                 | 4,750        | 3                     | 30,000        | 62       | 15,596       | 43                   | 7,377        | 7                                    | 5,519        | 2                                 | 2,700        |
| 14                       | 36,340       |                      |              | 5                                    | 3,540        | 2                                 | 3,300        | 7                                 | 29,500       |                       |               | 220      | 81,509       | 146                  | 21,009       | 70                                   | 38,500       |                                   |              |
| 7                        | 7,900        | 3                    | 1,200        |                                      |              | 2                                 | 2,700        | 2                                 | 4,000        |                       |               | 61       | 70,160       | 47                   | 7,160        | 2                                    | 1,400        | 5                                 | 5,800        |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               | 5        | 2,002        | 2                    | 202          | 3                                    | 1,800        |                                   |              |
| 10                       | 38,882       |                      |              | 2                                    | 1,342        |                                   |              | 4                                 | 10,720       | 4                     | 26,820        | 62       | 50,987       | 34                   | 6,432        | 5                                    | 4,125        | 15                                | 17,150       |
| 3                        | 6,025        |                      |              | 1                                    | 625          |                                   |              | 2                                 | 5,400        |                       |               | 19       | 2,954        | 18                   | 2,154        | 1                                    | 800          |                                   |              |
| 4                        | 8,750        |                      |              | 1                                    | 750          |                                   |              | 3                                 | 8,000        |                       |               |          |              |                      |              |                                      |              |                                   |              |
| 6                        | 4,390        |                      |              | 6                                    | 4,390        |                                   |              |                                   |              |                       |               | 9        | 6,280        | 3                    | 310          | 5                                    | 3,750        |                                   |              |
| 10                       | 12,850       |                      |              | 2                                    | 1,500        | 7                                 | 7,350        | 1                                 | 4,000        |                       |               | 97       | 24,799       | 86                   | 13,899       | 3                                    | 2,400        | 8                                 | 8,500        |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 21       | 1,682        | 21                   | 1,682        |                                      |              |                                   |              |
| 45                       | 202,345      | 5                    | 770          | 7                                    | 4,322        | 4                                 | 5,160        | 12                                | 30,093       | 17                    | 162,000       | 6        | 513          | 6                    | 513          |                                      |              |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 849      | 303,905      | 243                  | 42,423       | 32                                   | 20,782       | 25                                | 31,400       |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 30       | 9,676        | 18                   | 2,726        | 12                                   | 6,950        |                                   |              |
| 16                       | 42,716       | 1                    | 50           | 6                                    | 4,500        | 3                                 | 4,166        | 3                                 | 11,500       | 3                     | 22,500        | 1        | 100          | 1                    | 100          |                                      |              |                                   |              |
| 1                        | 750          |                      |              | 1                                    | 750          |                                   |              |                                   |              |                       |               | 18       | 1,682        | 18                   | 1,682        |                                      |              |                                   |              |
| 2                        | 4,000        |                      |              |                                      |              |                                   |              | 2                                 | 4,000        |                       |               | 70       | 101,877      | 36                   | 6,111        | 6                                    | 4,266        | 3                                 | 3,000        |
| 39                       | 49,061       | 7                    | 1,675        | 21                                   | 14,345       | 5                                 | 6,433        | 3                                 | 6,522        | 3                     | 20,106        | 117      | 30,578       | 108                  | 22,798       | 4                                    | 2,780        | 5                                 | 5,000        |
| 6                        | 12,020       |                      |              |                                      |              | 2                                 | 2,300        | 4                                 | 9,720        |                       |               | 16       | 2,263        | 16                   | 2,263        |                                      |              |                                   |              |
| 5                        | 4,100        | 3                    | 1,100        |                                      |              | 2                                 | 3,000        |                                   |              |                       |               | 52       | 75,430       | 21                   | 8,705        | 7                                    | 4,500        | 16                                | 20,625       |
| 6                        | 5,360        |                      |              | 4                                    | 2,680        | 2                                 | 2,680        |                                   |              |                       |               | 12       | 2,205        | 10                   | 1,005        | 2                                    | 1,200        |                                   |              |
| 11                       | 15,136       | 3                    | 1,100        | 1                                    | 536          | 3                                 | 3,500        | 4                                 | 10,000       |                       |               | 11       | 1,060        | 11                   | 1,060        |                                      |              |                                   |              |
| 1                        | 1,333        |                      |              |                                      |              | 1                                 | 1,333        |                                   |              |                       |               | 23       | 2,762        | 23                   | 2,762        |                                      |              |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 36       | 32,161       | 19                   | 2,861        | 6                                    | 3,900        | 8                                 | 10,600       |
| 3                        | 1,160        | 2                    | 410          | 1                                    | 750          |                                   |              |                                   |              |                       |               | 86       | 24,484       | 72                   | 13,234       | 13                                   | 9,060        |                                   |              |
| 5                        | 2,680        | 2                    | 410          | 3                                    | 2,270        |                                   |              |                                   |              |                       |               | 35       | 7,098        | 31                   | 3,273        | 1                                    | 600          | 3                                 | 3,225        |
| 8                        | 4,686        | 1                    | 30           | 7                                    | 4,656        |                                   |              |                                   |              |                       |               | 44       | 51,078       | 26                   | 5,378        | 7                                    | 4,700        | 2                                 | 2,000        |
| 1                        | 225          | 1                    | 225          |                                      |              |                                   |              |                                   |              |                       |               | 11       | 3,627        | 9                    | 1,927        | 2                                    | 1,700        |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 125      | 17,431       | 124                  | 16,881       | 1                                    | 550          |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 6        | 765          | 6                    | 765          |                                      |              |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 10       | 2,490        | 10                   | 2,490        |                                      |              |                                   |              |
|                          |              |                      |              |                                      |              |                                   |              |                                   |              |                       |               | 8        | 1,186        | 8                    | 1,186        |                                      |              |                                   |              |

\* Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 126.—COMMERCIAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER

| STATE OR TERRITORY. |                                          | PRIMARY POWER—continued.          |              |                       |              |              |              |                    |             | GENERATING AND OTHER MAIN-STATION EQUIPMENT. |             |                 |             |                               |         |
|---------------------|------------------------------------------|-----------------------------------|--------------|-----------------------|--------------|--------------|--------------|--------------------|-------------|----------------------------------------------|-------------|-----------------|-------------|-------------------------------|---------|
|                     |                                          | Water wheels—Continued.           |              |                       |              | Gas engines. |              | Auxiliary engines. |             | Dynamos.                                     |             |                 |             |                               |         |
|                     |                                          | 2,000 H. P. but under 5,000 H. P. |              | 5,000 H. P. and over. |              |              |              |                    |             | Aggregate.                                   |             |                 |             |                               |         |
|                     |                                          |                                   |              |                       |              |              |              |                    |             | Total.                                       |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |         |
|                     |                                          | Num-ber.                          | Horse-power. | Num-ber.              | Horse-power. | Num-ber.     | Horse-power. | Num-ber.           | Kilo-watts. | Num-ber.                                     | Kilo-watts. | Num-ber.        | Kilo-watts. |                               |         |
| 1                   | United States.....                       | 109                               | 326,580      | 55                    | 339,800      | 385          | 49,746       | 776                | 64,319      | 9,778                                        | 2,500,209   | 7,283           | 513,427     | 1,375                         | 389,833 |
| 2                   | Alabama.....                             |                                   |              |                       |              | 1            | 20           | 4                  | 150         | 68                                           | 13,872      | 45              | 3,697       | 15                            | 3,850   |
| 3                   | Arizona.....                             |                                   |              |                       |              | 3            | 70           | 2                  | 90          | 53                                           | 4,939       | 44              | 2,114       | 7                             | 1,825   |
| 4                   | Arkansas.....                            |                                   |              |                       |              | 1            | 12           | 7                  | 325         | 82                                           | 7,634       | 74              | 4,959       | 7                             | 2,175   |
| 5                   | California.....                          | 32                                | 89,000       | 7                     | 45,700       | 11           | 16,585       | 44                 | 26,315      | 313                                          | 235,612     | 116             | 9,194       | 80                            | 24,205  |
| 6                   | Colorado.....                            | 3                                 | 9,600        |                       |              | 4            | 300          | 31                 | 1,546       | 169                                          | 52,465      | 109             | 6,940       | 26                            | 7,025   |
| 7                   | Connecticut.....                         |                                   |              |                       |              | 1            | 21           | 12                 | 249         | 201                                          | 36,653      | 161             | 12,363      | 20                            | 4,900   |
| 8                   | Delaware <sup>1</sup> .....              |                                   |              |                       |              |              |              | 13                 | 1,205       | 65                                           | 25,763      | 40              | 2,947       | 14                            | 4,216   |
| 9                   | Florida.....                             |                                   |              |                       |              |              |              | 1                  | 3           | 41                                           | 4,116       | 37              | 3,051       | 4                             | 1,065   |
| 10                  | Georgia.....                             | 7                                 | 16,800       |                       |              | 1            | 140          | 1                  | 100         | 78                                           | 28,331      | 49              | 3,626       | 7                             | 1,655   |
| 11                  | Idaho.....                               |                                   |              |                       |              |              |              |                    |             | 44                                           | 6,922       | 32              | 2,472       | 7                             | 1,950   |
| 12                  | Illinois.....                            |                                   |              |                       |              | 8            | 568          | 48                 | 922         | 683                                          | 190,295     | 561             | 40,245      | 67                            | 20,850  |
| 13                  | Indiana.....                             |                                   |              |                       |              | 11           | 955          | 27                 | 1,635       | 392                                          | 66,224      | 309             | 22,072      | 50                            | 13,402  |
| 14                  | Iowa.....                                |                                   |              |                       |              | 9            | 398          | 11                 | 384         | 279                                          | 25,696      | 250             | 15,482      | 23                            | 6,364   |
| 15                  | Kansas.....                              |                                   |              |                       |              | 14           | 1,301        | 18                 | 911         | 174                                          | 25,393      | 141             | 9,188       | 20                            | 5,705   |
| 16                  | Kentucky.....                            |                                   |              |                       |              | 1            | 15           | 10                 | 305         | 145                                          | 26,331      | 114             | 7,796       | 20                            | 5,235   |
| 17                  | Louisiana.....                           |                                   |              |                       |              | 3            | 420          | 15                 | 505         | 44                                           | 12,270      | 25              | 1,870       | 10                            | 3,200   |
| 18                  | Maine.....                               |                                   |              |                       |              |              |              | 8                  | 1,071       | 202                                          | 38,428      | 136             | 9,058       | 42                            | 12,250  |
| 19                  | Maryland.....                            |                                   |              |                       |              | 3            | 95           | 4                  | 53          | 135                                          | 34,911      | 101             | 6,411       | 20                            | 4,600   |
| 20                  | Massachusetts.....                       |                                   |              |                       |              | 8            | 769          | 15                 | 790         | 534                                          | 126,102     | 396             | 28,793      | 75                            | 22,834  |
| 21                  | Michigan.....                            |                                   |              | 4                     | 22,000       | 8            | 334          | 21                 | 680         | 339                                          | 82,062      | 240             | 15,457      | 60                            | 17,605  |
| 22                  | Minnesota.....                           | 4                                 | 16,800       | 3                     | 39,000       | 16           | 1,067        | 21                 | 643         | 220                                          | 67,307      | 169             | 10,577      | 27                            | 7,690   |
| 23                  | Mississippi.....                         |                                   |              |                       |              | 1            | 25           | 3                  | 465         | 43                                           | 4,620       | 34              | 2,420       | 8                             | 1,700   |
| 24                  | Missouri.....                            |                                   |              |                       |              | 12           | 893          | 122                | 6,226       | 201                                          | 60,840      | 164             | 10,890      | 14                            | 3,800   |
| 25                  | Montana.....                             | 8                                 | 29,280       |                       |              |              |              |                    |             | 90                                           | 39,247      | 47              | 3,067       | 20                            | 5,710   |
| 26                  | Nebraska.....                            |                                   |              |                       |              | 11           | 459          | 17                 | 922         | 131                                          | 17,030      | 118             | 6,850       | 7                             | 1,750   |
| 27                  | Nevada.....                              | 1                                 | 2,200        |                       |              | 6            | 485          | 1                  | 25          | 14                                           | 5,690       | 9               | 490         |                               |         |
| 28                  | New Hampshire.....                       |                                   |              |                       |              | 8            | 1,115        | 13                 | 1,005       | 135                                          | 31,372      | 77              | 6,752       | 35                            | 8,370   |
| 29                  | New Jersey.....                          |                                   |              |                       |              | 9            | 1,275        | 30                 | 1,535       | 333                                          | 69,349      | 213             | 17,080      | 81                            | 21,035  |
| 30                  | New Mexico.....                          |                                   |              |                       |              |              |              |                    |             | 38                                           | 3,789       | 35              | 2,764       | 2                             | 525     |
| 31                  | New York.....                            | 24                                | 62,800       | 25                    | 146,500      | 24           | 3,085        | 54                 | 3,375       | 979                                          | 473,664     | 661             | 51,342      | 153                           | 47,061  |
| 32                  | North Carolina.....                      |                                   |              |                       |              |              |              | 4                  | 325         | 67                                           | 9,062       | 52              | 3,387       | 11                            | 3,175   |
| 33                  | North Dakota.....                        |                                   |              |                       |              | 2            | 205          | 3                  | 152         | 49                                           | 4,809       | 44              | 3,539       | 5                             | 1,270   |
| 34                  | Ohio.....                                |                                   |              |                       |              | 45           | 4,303        | 30                 | 1,126       | 521                                          | 105,878     | 420             | 29,408      | 57                            | 16,070  |
| 35                  | Oklahoma.....                            |                                   |              |                       |              | 2            | 200          | 3                  | 74          | 105                                          | 14,114      | 78              | 6,164       | 24                            | 5,950   |
| 36                  | Oregon.....                              | 22                                | 73,500       | 3                     | 15,000       | 3            | 100          | 7                  | 504         | 102                                          | 32,096      | 48              | 3,346       | 35                            | 10,995  |
| 37                  | Pennsylvania.....                        |                                   |              |                       |              | 57           | 6,743        | 63                 | 6,042       | 1,167                                        | 203,682     | 916             | 68,732      | 154                           | 44,415  |
| 38                  | Rhode Island.....                        |                                   |              |                       |              | 4            | 1,000        | 18                 | 223         | 107                                          | 20,896      | 85              | 5,251       | 5                             | 1,295   |
| 39                  | South Carolina.....                      |                                   |              | 8                     | 41,600       | 1            | 150          | 3                  | 60          | 64                                           | 49,295      | 27              | 1,895       | 4                             | 1,100   |
| 40                  | South Dakota.....                        |                                   |              |                       |              | 7            | 296          | 5                  | 173         | 55                                           | 9,026       | 47              | 3,781       | 3                             | 745     |
| 41                  | Tennessee.....                           |                                   |              |                       |              |              |              | 10                 | 920         | 78                                           | 15,770      | 58              | 4,110       | 8                             | 2,000   |
| 42                  | Texas.....                               |                                   |              |                       |              | 53           | 3,058        | 40                 | 1,667       | 430                                          | 46,225      | 377             | 21,230      | 35                            | 9,045   |
| 43                  | Utah.....                                | 3                                 | 14,800       |                       |              |              |              |                    |             | 52                                           | 32,132      | 29              | 1,582       | 5                             | 1,250   |
| 44                  | Vermont.....                             | 1                                 | 2,200        |                       |              | 4            | 205          | 3                  | 105         | 96                                           | 19,057      | 57              | 4,166       | 31                            | 8,541   |
| 45                  | Virginia.....                            |                                   |              |                       |              | 1            | 60           | 2                  | 140         | 60                                           | 7,063       | 53              | 3,863       | 4                             | 960     |
| 46                  | Washington.....                          | 4                                 | 9,000        | 5                     | 30,000       | 2            | 90           | 11                 | 338         | 122                                          | 62,498      | 79              | 6,168       | 20                            | 5,930   |
| 47                  | West Virginia.....                       |                                   |              |                       |              | 9            | 925          | 5                  | 385         | 101                                          | 14,009      | 77              | 5,964       | 18                            | 4,845   |
| 48                  | Wisconsin.....                           |                                   |              |                       |              | 21           | 2,004        | 12                 | 600         | 337                                          | 34,462      | 291             | 18,112      | 33                            | 9,350   |
| 49                  | Wyoming.....                             |                                   |              |                       |              |              |              | 4                  | 50          | 40                                           | 3,268       | 38              | 2,733       | 2                             | 475     |
| 50                  | Alaska.....                              |                                   |              |                       |              |              |              | 2                  | 20          | 25                                           | 2,449       | 22              | 1,574       | 3                             | 875     |
| 51                  | Hawaii and Porto Rico <sup>2</sup> ..... |                                   |              |                       |              |              |              | 1                  | 40          | 24                                           | 2,562       | 21              | 1,662       | 3                             | 900     |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907—Continued.

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |             |                                   |             |                                   |             |                       |             |                                   |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
|--------------------------------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|-----------------------|-------------|-----------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|
| Dynamos—Continued.                                     |             |                                   |             |                                   |             |                       |             |                                   |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
| Aggregate—Continued.                                   |             |                                   |             |                                   |             |                       |             | Direct-current, constant-voltage. |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |
| 500 K. W. but under 1,000 K. W.                        |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             | 5,000 K. W. and over. |             | Total.                            |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             |
| Num-ber.                                               | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.              | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.        | Kilo-watts. | Num-ber.                      | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. |
| 613                                                    | 383,009     | 278                               | 346,900     | 162                               | 436,350     | 67                    | 430,000     | 3,169                             | 379,706     | 2,622           | 158,311     | 412                           | 113,955     | 102                             | 63,890      | 30                                | 26,550      | 3                                 | 7,000       |
| 6                                                      | 4,125       | 2                                 | 2,200       |                                   |             |                       |             | 24                                | 4,003       | 16              | 1,253       | 7                             | 1,750       |                                 |             | 1                                 | 1,000       |                                   |             |
| 2                                                      | 1,000       |                                   |             |                                   |             |                       |             | 27                                | 737         | 27              | 737         |                               |             |                                 |             |                                   |             |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 31                                | 2,145       | 28              | 1,345       | 3                             | 800         |                                 |             |                                   |             |                                   |             |
| 50                                                     | 35,213      | 31                                | 43,000      | 22                                | 51,500      | 14                    | 72,500      | 65                                | 8,900       | 43              | 2,075       | 20                            | 5,105       | 1                               | 720         | 1                                 | 1,000       |                                   |             |
| 20                                                     | 12,550      | 7                                 | 8,700       | 7                                 | 17,250      |                       |             | 57                                | 4,852       | 46              | 2,102       | 11                            | 2,750       |                                 |             |                                   |             |                                   |             |
| 7                                                      | 3,890       | 12                                | 13,500      | 1                                 | 2,000       |                       |             | 63                                | 6,372       | 57              | 5,122       | 6                             | 1,250       |                                 |             |                                   |             |                                   |             |
| 6                                                      | 3,600       | 1                                 | 1,000       | 2                                 | 4,000       | 2                     | 10,000      | 26                                | 4,870       | 15              | 1,320       | 10                            | 2,950       | 1                               | 600         |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 4                                 | 470         | 3               | 170         | 1                             | 300         |                                 |             |                                   |             |                                   |             |
| 9                                                      | 5,750       | 13                                | 17,400      |                                   |             |                       |             | 17                                | 1,271       | 14              | 621         | 3                             | 650         |                                 |             |                                   |             |                                   |             |
| 5                                                      | 2,500       |                                   |             |                                   |             |                       |             | 9                                 | 147         | 9               | 147         |                               |             |                                 |             |                                   |             |                                   |             |
| 28                                                     | 16,900      | 13                                | 14,300      | 4                                 | 11,000      | 10                    | 87,000      | 241                               | 32,606      | 195             | 11,996      | 28                            | 13,310      | 6                               | 3,800       | 1                                 | 1,000       | 1                                 | 2,500       |
| 20                                                     | 12,150      | 12                                | 16,600      | 1                                 | 2,000       |                       |             | 105                               | 12,001      | 87              | 5,251       | 14                            | 3,250       | 3                               | 2,000       | 1                                 | 1,500       |                                   |             |
| 5                                                      | 2,850       | 1                                 | 1,000       |                                   |             |                       |             | 123                               | 9,142       | 114             | 5,592       | 7                             | 1,750       | 1                               | 800         | 1                                 | 1,000       |                                   |             |
| 10                                                     | 5,500       | 2                                 | 3,000       | 1                                 | 2,000       |                       |             | 63                                | 6,121       | 55              | 3,161       | 5                             | 1,460       | 3                               | 1,600       |                                   |             |                                   |             |
| 7                                                      | 4,050       | 1                                 | 1,000       | 3                                 | 8,250       |                       |             | 50                                | 5,168       | 43              | 2,368       | 6                             | 2,000       | 1                               | 800         |                                   |             |                                   |             |
| 6                                                      | 4,100       | 3                                 | 3,100       |                                   |             |                       |             | 21                                | 4,965       | 15              | 1,015       | 2                             | 800         | 3                               | 2,100       | 1                                 | 1,050       |                                   |             |
| 23                                                     | 16,120      | 1                                 | 1,000       |                                   |             |                       |             | 56                                | 5,714       | 48              | 2,849       | 4                             | 865         | 4                               | 2,000       |                                   |             |                                   |             |
| 5                                                      | 3,400       | 1                                 | 1,500       | 7                                 | 14,000      | 1                     | 5,000       | 27                                | 2,302       | 22              | 1,302       | 5                             | 1,000       |                                 |             |                                   |             |                                   |             |
| 40                                                     | 24,125      | 19                                | 25,600      | 1                                 | 2,250       | 3                     | 22,500      | 157                               | 26,441      | 126             | 9,616       | 17                            | 4,450       | 10                              | 5,975       | 4                                 | 6,400       |                                   |             |
| 14                                                     | 7,500       | 18                                | 20,500      | 7                                 | 21,000      |                       |             | 104                               | 10,180      | 87              | 4,205       | 15                            | 4,475       | 1                               | 1,000       |                                   |             |                                   |             |
| 7                                                      | 4,540       | 10                                | 12,000      | 4                                 | 10,000      | 3                     | 22,500      | 94                                | 8,267       | 82              | 4,242       | 11                            | 3,025       |                                 |             | 1                                 | 1,000       |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 11                                | 566         | 11              | 566         |                               |             |                                 |             |                                   |             |                                   |             |
| 9                                                      | 4,650       | 3                                 | 4,500       | 7                                 | 17,000      | 4                     | 20,000      | 81                                | 9,257       | 70              | 3,147       | 3                             | 960         | 7                               | 3,650       | 1                                 | 1,500       |                                   |             |
| 15                                                     | 10,250      |                                   |             | 8                                 | 20,200      |                       |             | 24                                | 2,091       | 21              | 1,391       | 3                             | 700         |                                 |             |                                   |             |                                   |             |
| 2                                                      | 1,250       | 2                                 | 2,700       | 2                                 | 4,500       |                       |             | 57                                | 3,057       | 54              | 2,282       | 3                             | 775         |                                 |             |                                   |             |                                   |             |
| 4                                                      | 3,000       |                                   |             | 1                                 | 2,200       |                       |             | 3                                 | 60          | 3               | 60          |                               |             |                                 |             |                                   |             |                                   |             |
| 18                                                     | 10,050      | 4                                 | 4,200       | 1                                 | 2,000       |                       |             | 26                                | 3,682       | 19              | 1,232       | 4                             | 950         | 3                               | 1,500       |                                   |             |                                   |             |
| 31                                                     | 21,225      | 7                                 | 7,000       | 1                                 | 3,000       |                       |             | 90                                | 21,072      | 36              | 2,522       | 41                            | 9,450       | 12                              | 8,100       | 1                                 | 1,000       |                                   |             |
| 1                                                      | 500         |                                   |             |                                   |             |                       |             | 17                                | 925         | 17              | 925         |                               |             |                                 |             |                                   |             |                                   |             |
| 58                                                     | 38,611      | 39                                | 47,800      | 49                                | 155,350     | 19                    | 133,500     | 276                               | 48,151      | 209             | 17,381      | 44                            | 13,050      | 18                              | 12,720      | 5                                 | 5,000       |                                   |             |
| 4                                                      | 2,500       |                                   |             |                                   |             |                       |             | 23                                | 1,447       | 21              | 1,047       | 2                             | 400         |                                 |             |                                   |             |                                   |             |
| 22                                                     | 13,200      | 13                                | 16,700      | 6                                 | 15,500      | 3                     | 15,000      | 36                                | 3,134       | 34              | 2,714       | 2                             | 420         |                                 |             |                                   |             |                                   |             |
| 2                                                      | 1,000       | 1                                 | 1,000       |                                   |             |                       |             | 188                               | 31,765      | 153             | 9,465       | 23                            | 8,000       | 5                               | 3,600       | 6                                 | 8,200       | 1                                 | 2,500       |
| 14                                                     | 8,255       | 5                                 | 9,500       |                                   |             |                       |             | 29                                | 2,970       | 24              | 1,620       | 5                             | 1,350       |                                 |             |                                   |             |                                   |             |
| 68                                                     | 41,635      | 24                                | 26,900      | 1                                 | 2,000       | 4                     | 20,000      | 376                               | 48,125      | 303             | 22,310      | 61                            | 17,165      | 9                               | 5,150       | 3                                 | 3,500       |                                   |             |
| 13                                                     | 7,100       | 2                                 | 3,000       | 2                                 | 4,250       |                       |             | 35                                | 8,374       | 23              | 2,079       | 5                             | 1,295       | 6                               | 3,000       |                                   |             | 1                                 | 2,000       |
| 16                                                     | 11,500      | 9                                 | 10,800      | 8                                 | 24,000      |                       |             | 2                                 | 150         | 2               | 150         |                               |             |                                 |             |                                   |             |                                   |             |
| 3                                                      | 1,500       | 2                                 | 3,000       |                                   |             |                       |             | 17                                | 1,151       | 17              | 1,151       |                               |             |                                 |             |                                   |             |                                   |             |
| 8                                                      | 4,660       | 3                                 | 3,000       | 1                                 | 2,000       |                       |             | 17                                | 1,490       | 14              | 490         | 2                             | 500         | 1                               | 500         |                                   |             |                                   |             |
| 11                                                     | 6,950       | 7                                 | 9,000       |                                   |             |                       |             | 206                               | 11,977      | 191             | 7,252       | 12                            | 2,775       | 3                               | 1,950       |                                   |             |                                   |             |
| 10                                                     | 6,700       | 2                                 | 2,000       | 4                                 | 9,600       | 2                     | 11,000      | 13                                | 522         | 13              | 522         |                               |             |                                 |             |                                   |             |                                   |             |
| 6                                                      | 3,350       | 1                                 | 1,000       | 1                                 | 2,000       |                       |             | 11                                | 863         | 9               | 463         | 2                             | 400         |                                 |             |                                   |             |                                   |             |
| 3                                                      | 2,250       |                                   |             |                                   |             |                       |             | 19                                | 1,144       | 19              | 1,144       |                               |             |                                 |             |                                   |             |                                   |             |
| 4                                                      | 2,500       | 7                                 | 9,400       | 10                                | 27,500      | 2                     | 11,000      | 30                                | 5,484       | 24              | 1,184       | 2                             | 400         | 2                               | 1,500       | 2                                 | 2,400       |                                   |             |
| 6                                                      | 3,200       |                                   |             |                                   |             |                       |             | 31                                | 2,255       | 30              | 2,055       | 1                             | 200         |                                 |             |                                   |             |                                   |             |
| 13                                                     | 7,000       |                                   |             |                                   |             |                       |             | 150                               | 8,641       | 145             | 7,516       | 5                             | 1,125       |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 18                                | 923         | 18              | 923         |                               |             |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 10                                | 419         | 10              | 419         |                               |             |                                 |             |                                   |             |                                   |             |
|                                                        |             |                                   |             |                                   |             |                       |             | 11                                | 797         | 10              | 597         | 1                             | 200         |                                 |             |                                   |             |                                   |             |

\* Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 126.—COMMERCIAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER

| STATE OR TERRITORY.                         | GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |             |                 |             |                               |             |                                 |             |                                   |             |                                                  |             |                 |             |
|---------------------------------------------|--------------------------------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|--------------------------------------------------|-------------|-----------------|-------------|
|                                             | Dynamoes—Continued.                                    |             |                 |             |                               |             |                                 |             |                                   |             |                                                  |             |                 |             |
|                                             | Direct-current, constant-amperage.                     |             |                 |             |                               |             |                                 |             |                                   |             | Alternating single-phase and poly-phase current. |             |                 |             |
|                                             | Total.                                                 |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | Total.                                           |             | Under 200 K. W. |             |
|                                             | Num-ber.                                               | Kilo-watts. | Num-ber.        | Kilo-watts. | Num-ber.                      | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                                         | Kilo-watts. | Num-ber.        | Kilo-watts. |
| 1 United States.....                        | 1,246                                                  | 61,753      | 1,229           | 53,678      | 12                            | 3,565       | 3                               | 2,010       | 2                                 | 2,500       | 5,363                                            | 2,058,750   | 3,432           | 301,438     |
| 2 Alabama.....                              | 1                                                      | 42          | 1               | 42          |                               |             |                                 |             |                                   |             | 43                                               | 9,827       | 28              | 2,402       |
| 3 Arizona.....                              | 1                                                      | 40          | 1               | 40          |                               |             |                                 |             |                                   |             | 25                                               | 4,162       | 16              | 1,337       |
| 4 Arkansas.....                             |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 51                                               | 5,489       | 46              | 3,614       |
| 5 California.....                           | 3                                                      | 124         | 3               | 124         |                               |             |                                 |             |                                   |             | 245                                              | 226,588     | 70              | 6,995       |
| 6 Colorado.....                             | 18                                                     | 1,155       | 18              | 1,155       |                               |             |                                 |             |                                   |             | 94                                               | 46,458      | 45              | 3,683       |
| 7 Connecticut.....                          | 50                                                     | 1,590       | 50              | 1,590       |                               |             |                                 |             |                                   |             | 88                                               | 28,691      | 54              | 5,651       |
| 8 Delaware <sup>1</sup> .....               | 16                                                     | 712         | 16              | 712         |                               |             |                                 |             |                                   |             | 23                                               | 20,181      | 9               | 915         |
| 9 Florida.....                              | 1                                                      | 29          | 1               | 29          |                               |             |                                 |             |                                   |             | 36                                               | 3,617       | 33              | 2,852       |
| 10 Georgia.....                             | 6                                                      | 183         | 6               | 183         |                               |             |                                 |             |                                   |             | 55                                               | 26,877      | 29              | 2,822       |
| 11 Idaho.....                               |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 35                                               | 6,775       | 23              | 2,325       |
| 12 Illinois.....                            | 76                                                     | 3,469       | 74              | 2,969       | 2                             | 500         |                                 |             |                                   |             | 366                                              | 154,220     | 292             | 25,280      |
| 13 Indiana.....                             | 85                                                     | 3,809       | 85              | 3,809       |                               |             |                                 |             |                                   |             | 202                                              | 50,414      | 137             | 13,012      |
| 14 Iowa.....                                | 13                                                     | 252         | 13              | 252         |                               |             |                                 |             |                                   |             | 143                                              | 16,302      | 123             | 9,638       |
| 15 Kansas.....                              | 9                                                      | 389         | 9               | 389         |                               |             |                                 |             |                                   |             | 102                                              | 18,883      | 77              | 5,638       |
| 16 Kentucky.....                            | 6                                                      | 177         | 6               | 177         |                               |             |                                 |             |                                   |             | 89                                               | 20,986      | 65              | 5,251       |
| 17 Louisiana.....                           |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 23                                               | 7,305       | 10              | 855         |
| 18 Maine.....                               | 22                                                     | 1,179       | 20              | 614         | 2                             | 565         |                                 |             |                                   |             | 124                                              | 31,535      | 68              | 5,595       |
| 19 Maryland.....                            | 46                                                     | 2,064       | 46              | 2,064       |                               |             |                                 |             |                                   |             | 62                                               | 30,545      | 33              | 3,045       |
| 20 Massachusetts.....                       | 141                                                    | 6,789       | 141             | 6,789       |                               |             |                                 |             |                                   |             | 236                                              | 92,872      | 129             | 12,388      |
| 21 Michigan.....                            | 40                                                     | 1,286       | 40              | 1,286       |                               |             |                                 |             |                                   |             | 195                                              | 70,596      | 113             | 9,966       |
| 22 Minnesota.....                           | 29                                                     | 1,097       | 29              | 1,097       |                               |             |                                 |             |                                   |             | 97                                               | 57,943      | 58              | 5,238       |
| 23 Mississippi.....                         |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 32                                               | 4,054       | 23              | 1,854       |
| 24 Missouri.....                            | 9                                                      | 278         | 9               | 278         |                               |             |                                 |             |                                   |             | 111                                              | 51,305      | 85              | 7,465       |
| 25 Montana.....                             | 9                                                      | 244         | 9               | 244         |                               |             |                                 |             |                                   |             | 57                                               | 36,912      | 17              | 1,452       |
| 26 Nebraska.....                            |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 74                                               | 13,973      | 64              | 4,568       |
| 27 Nevada.....                              |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 11                                               | 5,630       | 6               | 430         |
| 28 New Hampshire.....                       | 2                                                      | 100         | 2               | 100         |                               |             |                                 |             |                                   |             | 107                                              | 27,590      | 56              | 5,420       |
| 29 New Jersey.....                          | 75                                                     | 3,870       | 75              | 3,870       |                               |             |                                 |             |                                   |             | 168                                              | 44,407      | 102             | 10,697      |
| 30 New Mexico.....                          |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 21                                               | 2,864       | 18              | 1,839       |
| 31 New York.....                            | 133                                                    | 10,277      | 127             | 5,627       | 2                             | 900         | 2                               | 1,250       | 2                                 | 2,500       | 570                                              | 415,236     | 325             | 28,334      |
| 32 North Carolina.....                      | 1                                                      | 30          | 1               | 30          |                               |             |                                 |             |                                   |             | 43                                               | 7,585       | 30              | 2,310       |
| 33 North Dakota.....                        | 2                                                      | 50          | 2               | 50          |                               |             |                                 |             |                                   |             | 11                                               | 1,625       | 8               | 775         |
| 34 Ohio.....                                | 96                                                     | 4,252       | 96              | 4,252       |                               |             |                                 |             |                                   |             | 237                                              | 69,861      | 171             | 15,691      |
| 35 Oklahoma.....                            |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 76                                               | 11,144      | 54              | 4,544       |
| 36 Oregon.....                              |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 83                                               | 28,340      | 38              | 3,115       |
| 37 Pennsylvania.....                        | 263                                                    | 14,864      | 257             | 12,804      | 5                             | 1,300       | 1                               | 760         |                                   |             | 528                                              | 140,693     | 356             | 33,618      |
| 38 Rhode Island.....                        | 44                                                     | 1,763       | 44              | 1,763       |                               |             |                                 |             |                                   |             | 28                                               | 10,759      | 18              | 1,409       |
| 39 South Carolina.....                      |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 62                                               | 49,145      | 25              | 1,745       |
| 40 South Dakota.....                        | 1                                                      | 22          | 1               | 22          |                               |             |                                 |             |                                   |             | 37                                               | 7,853       | 29              | 2,608       |
| 41 Tennessee.....                           | 1                                                      | 50          | 1               | 50          |                               |             |                                 |             |                                   |             | 60                                               | 14,230      | 43              | 3,570       |
| 42 Texas.....                               | 1                                                      | 35          | 1               | 35          |                               |             |                                 |             |                                   |             | 223                                              | 34,213      | 185             | 13,943      |
| 43 Utah.....                                |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 39                                               | 31,610      | 16              | 1,060       |
| 44 Vermont.....                             | 9                                                      | 478         | 8               | 178         | 1                             | 300         |                                 |             |                                   |             | 76                                               | 17,716      | 40              | 3,525       |
| 45 Virginia.....                            | 1                                                      | 25          | 1               | 25          |                               |             |                                 |             |                                   |             | 40                                               | 5,894       | 33              | 2,694       |
| 46 Washington.....                          |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 92                                               | 57,014      | 55              | 4,984       |
| 47 West Virginia.....                       | 3                                                      | 92          | 3               | 92          |                               |             |                                 |             |                                   |             | 67                                               | 11,662      | 44              | 3,817       |
| 48 Wisconsin.....                           | 32                                                     | 857         | 32              | 857         |                               |             |                                 |             |                                   |             | 155                                              | 24,964      | 114             | 9,739       |
| 49 Wyoming.....                             | 1                                                      | 80          | 1               | 80          |                               |             |                                 |             |                                   |             | 21                                               | 2,205       | 19              | 1,730       |
| 50 Alaska.....                              |                                                        |             |                 |             |                               |             |                                 |             |                                   |             | 15                                               | 2,030       | 12              | 1,155       |
| 51 Hawaii and Porto Rico <sup>1</sup> ..... | 3                                                      | 90          | 3               | 90          |                               |             |                                 |             |                                   |             | 10                                               | 1,675       | 8               | 975         |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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## AND GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907—Continued.

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued.    |             |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         |                                               |    |    |
|-----------------------------------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|-----------------------|-------------|---------------|-------------|-----------|-------------|-----------|-------------|-----------------------------------------|-----------------------------------------------|----|----|
| Dynamos—Continued.                                        |             |                                 |             |                                   |             |                                   |             |                       |             | Transformers. |             | Boosters. |             | Rotaries. |             | Storage-battery cells in main stations. | Kilowatt capacity of miscellaneous apparatus. |    |    |
| Alternating single-phase and polyphase current—Continued. |             |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         |                                               |    |    |
| 200 K. W. but under 500 K. W.                             |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             | 5,000 K. W. and over. |             |               |             |           |             |           |             |                                         |                                               |    |    |
| Num-ber.                                                  | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.              | Kilo-watts. | Num-ber.      | Kilo-watts. | Num-ber.  | Kilo-watts. | Num-ber.  | Kilo-watts. |                                         |                                               |    |    |
| 951                                                       | 272,313     | 508                             | 317,799     | 246                               | 307,850     | 159                               | 429,350     | 67                    | 430,000     | 1,432         | 587,421     | 106       | 4,474       | 175       | 51,703      | 9,255                                   | 42,256                                        | 1  |    |
| 8                                                         | 2,100       | 6                               | 4,125       | 1                                 | 1,200       |                                   |             |                       |             | 12            | 3,801       |           |             | 2         | 600         |                                         |                                               | 2  |    |
| 7                                                         | 1,825       | 2                               | 1,000       |                                   |             |                                   |             |                       |             | 2             | 266         | 3         | 85          | 2         | 300         |                                         |                                               | 3  |    |
| 4                                                         | 1,375       | 1                               | 500         |                                   |             |                                   |             |                       |             |               |             |           |             | 2         | 680         |                                         |                                               | 4  |    |
| 60                                                        | 19,100      | 49                              | 34,493      | 30                                | 42,000      | 22                                | 51,500      | 14                    | 72,500      | 263           | 131,354     | 4         | 136         | 6         | 2,000       | 118                                     | 70                                            | 5  |    |
| 15                                                        | 4,275       | 20                              | 12,550      | 7                                 | 8,700       | 7                                 | 17,250      |                       |             | 73            | 21,251      | 7         | 414         | 1         | 350         | 268                                     | 470                                           | 6  |    |
| 14                                                        | 3,650       | 7                               | 3,890       | 12                                | 13,500      | 1                                 | 2,000       |                       |             | 10            | 6,885       | 2         | 250         | 1         | 200         |                                         |                                               | 7  |    |
| 1                                                         | 1,266       | 5                               | 3,000       | 1                                 | 1,000       | 2                                 | 4,000       | 2                     | 10,000      | 3             | 130         | 4         | 266         | 1         | 500         | 204                                     | 2,670                                         | 8  |    |
| 3                                                         | 765         |                                 |             |                                   |             |                                   |             |                       |             | 4             | 47          |           |             |           |             |                                         |                                               | 9  |    |
| 4                                                         | 905         | 9                               | 5,750       | 13                                | 17,400      |                                   |             |                       |             | 17            | 15,900      |           |             |           |             |                                         |                                               | 10 |    |
| 7                                                         | 1,950       | 5                               | 2,500       |                                   |             |                                   |             |                       |             | 20            | 2,675       | 1         | 40          |           |             |                                         | 19                                            | 11 |    |
| 27                                                        | 7,040       | 22                              | 13,100      | 12                                | 13,300      | 3                                 | 8,500       | 10                    | 87,000      | 46            | 4,167       | 11        | 315         | 13        | 3,095       | 1,285                                   | 1,898                                         | 12 |    |
| 36                                                        | 10,152      | 17                              | 10,150      | 11                                | 15,100      | 1                                 | 2,000       |                       |             | 20            | 1,630       |           |             | 7         | 2,200       |                                         | 80                                            | 13 |    |
| 16                                                        | 4,614       | 4                               | 2,050       |                                   |             |                                   |             |                       |             | 12            | 486         | 1         | 12          | 4         | 866         | 432                                     | 385                                           | 14 |    |
| 15                                                        | 4,245       | 7                               | 4,000       | 2                                 | 3,000       | 1                                 | 2,000       |                       |             | 39            | 6,446       | 1         | 30          |           |             | 280                                     | 1,029                                         | 15 |    |
| 14                                                        | 3,235       | 6                               | 3,250       | 1                                 | 1,000       | 3                                 | 8,250       |                       |             | 9             | 504         | 4         | 19          |           |             |                                         | 115                                           | 16 |    |
| 8                                                         | 2,400       | 3                               | 2,000       | 2                                 | 2,050       |                                   |             |                       |             |               |             | 1         | 10          | 3         | 650         |                                         |                                               | 17 |    |
| 36                                                        | 10,820      | 19                              | 14,120      | 1                                 | 1,000       |                                   |             |                       |             | 23            | 10,648      | 1         | 60          |           |             |                                         |                                               | 18 |    |
| 15                                                        | 3,600       | 5                               | 3,400       | 1                                 | 1,500       | 7                                 | 14,000      | 1                     | 5,000       | 4             | 160         | 1         | 2           | 1         | 300         | 168                                     | 200                                           | 19 |    |
| 58                                                        | 18,384      | 30                              | 18,150      | 15                                | 19,200      | 1                                 | 2,250       | 3                     | 22,500      | 46            | 2,871       | 4         | 202         | 7         | 2,000       | 67                                      | 860                                           | 20 |    |
| 45                                                        | 13,130      | 13                              | 7,000       | 17                                | 19,500      | 7                                 | 21,000      |                       |             | 43            | 20,197      | 4         | 127         | 21        | 6,100       | 646                                     | 740                                           | 21 |    |
| 16                                                        | 4,665       | 7                               | 4,540       | 9                                 | 11,000      | 4                                 | 10,000      | 3                     | 22,500      | 45            | 40,096      | 3         | 68          |           |             | 248                                     | 1,303                                         | 22 |    |
| 8                                                         | 1,700       | 1                               | 500         |                                   |             |                                   |             |                       |             | 3             | 82          | 2         | 15          | 2         | 600         |                                         |                                               | 23 |    |
| 11                                                        | 2,840       | 2                               | 1,000       | 2                                 | 3,000       | 7                                 | 17,000      | 4                     | 20,000      | 4             | 90          | 2         | 15          |           |             | 203                                     |                                               | 24 |    |
| 17                                                        | 5,010       | 15                              | 10,250      |                                   |             | 8                                 | 20,200      |                       |             | 40            | 34,175      | 3         | 45          | 1         | 200         |                                         | 796                                           | 25 |    |
| 4                                                         | 955         | 2                               | 1,250       | 2                                 | 2,700       | 2                                 | 4,500       |                       |             | 4             | 152         | 1         | 2           | 3         | 1,300       | 60                                      |                                               | 26 |    |
|                                                           |             | 4                               | 3,000       |                                   |             | 1                                 | 2,200       |                       |             | 12            | 4,200       | 1         | 8           | 1         | 500         | 64                                      |                                               | 27 |    |
| 31                                                        | 7,420       | 15                              | 8,550       | 4                                 | 4,200       | 1                                 | 2,000       |                       |             | 6             | 300         |           |             |           |             | 236                                     | 7                                             | 28 |    |
| 40                                                        | 11,585      | 19                              | 13,125      | 6                                 | 6,000       | 1                                 | 3,000       |                       |             | 10            | 132         | 7         | 566         | 11        | 3,835       | 974                                     | 584                                           | 29 |    |
| 2                                                         | 525         | 1                               | 500         |                                   |             |                                   |             |                       |             | 3             | 22          |           |             |           |             |                                         | 2                                             | 30 |    |
| 107                                                       | 33,111      | 38                              | 24,641      | 32                                | 40,300      | 49                                | 155,350     | 19                    | 133,500     | 254           | 92,324      | 22        | 570         | 27        | 7,914       | 1,199                                   | 18,988                                        | 31 |    |
| 9                                                         | 2,775       | 4                               | 2,500       |                                   |             |                                   |             |                       |             | 5             | 1,571       |           |             |           |             |                                         |                                               | 32 |    |
| 3                                                         | 850         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             | 2         | 108         |                                         | 275                                           | 33 |    |
| 34                                                        | 8,070       | 17                              | 9,600       | 7                                 | 8,500       | 5                                 | 13,000      | 3                     | 15,000      | 22            | 11,349      | 1         | 100         | 8         | 2,975       | 610                                     | 3,898                                         | 34 |    |
| 19                                                        | 4,600       | 2                               | 1,000       | 1                                 | 1,000       |                                   |             |                       |             | 8             | 231         | 1         | 7           |           |             |                                         | 350                                           | 35 |    |
| 28                                                        | 8,895       | 12                              | 6,830       | 5                                 | 9,500       |                                   |             |                       |             | 41            | 13,380      |           |             |           |             |                                         | 625                                           | 36 |    |
| 88                                                        | 25,950      | 58                              | 35,725      | 21                                | 23,400      | 1                                 | 2,000       | 4                     | 20,000      | 70            | 21,654      | 3         | 238         | 20        | 4,470       | 901                                     | 4,354                                         | 37 |    |
|                                                           |             | 7                               | 4,100       | 2                                 | 3,000       | 1                                 | 2,250       |                       |             | 34            | 3,225       | 5         | 462         | 5         | 2,100       | 548                                     |                                               | 38 |    |
| 4                                                         | 1,100       | 16                              | 11,500      | 9                                 | 10,800      | 8                                 | 24,000      |                       |             | 30            | 29,518      |           |             |           |             |                                         | 55                                            | 39 |    |
| 3                                                         | 745         | 3                               | 1,500       | 2                                 | 3,000       |                                   |             |                       |             | 5             | 1,250       |           |             | 1         | 150         | 134                                     |                                               | 40 |    |
| 6                                                         | 1,500       | 7                               | 4,160       | 3                                 | 3,000       | 1                                 | 2,000       |                       |             | 10            | 2,570       | 1         | 4           | 7         | 2,300       |                                         | 885                                           | 41 |    |
| 23                                                        | 6,270       | 8                               | 5,000       | 7                                 | 9,000       |                                   |             |                       |             | 8             | 429         |           |             |           |             |                                         |                                               | 42 |    |
| 5                                                         | 1,250       | 10                              | 6,700       | 2                                 | 2,000       | 4                                 | 9,600       | 2                     | 11,000      | 56            | 35,762      | 2         | 240         | 7         | 1,700       |                                         | 535                                           | 43 |    |
| 28                                                        | 7,841       | 6                               | 3,350       | 1                                 | 1,000       | 1                                 | 2,000       |                       |             | 30            | 4,168       |           |             |           |             | 189                                     |                                               | 44 |    |
| 4                                                         | 950         | 3                               | 2,250       |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         |                                               | 37 | 45 |
| 18                                                        | 5,530       | 2                               | 1,000       | 5                                 | 7,000       | 10                                | 27,500      | 2                     | 11,000      | 61            | 56,641      | 2         | 151         | 5         | 1,510       | 55                                      | 206                                           | 46 |    |
| 17                                                        | 4,645       | 6                               | 3,200       |                                   |             |                                   |             |                       |             | 12            | 1,682       |           |             |           |             |                                         | 433                                           | 47 |    |
| 28                                                        | 8,225       | 13                              | 7,000       |                                   |             |                                   |             |                       |             | 13            | 3,100       | 1         | 15          | 4         | 1,600       | 276                                     | 320                                           | 48 |    |
| 2                                                         | 475         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             |           |             |                                         | 15                                            | 49 |    |
| 3                                                         | 875         |                                 |             |                                   |             |                                   |             |                       |             | 6             | 900         |           |             |           |             |                                         |                                               | 50 |    |
| 2                                                         | 700         |                                 |             |                                   |             |                                   |             |                       |             |               |             |           |             | 1         | 250         |                                         |                                               | 51 |    |

<sup>1</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 127.—COMMERCIAL CENTRAL ELECTRIC STATIONS—SUBSTATION EQUIPMENT, MOTORS, TRANS-

| 1  | STATE OR TERRITORY.        | Number of stations. | SUBSTATION PLANTS.       |               |            |           |            |                                       |
|----|----------------------------|---------------------|--------------------------|---------------|------------|-----------|------------|---------------------------------------|
|    |                            |                     | Total kilowatt capacity. | Transformers. |            | Rotaries. |            | Number of cells in storage batteries. |
|    |                            |                     |                          | Number.       | Kilowatts. | Number.   | Kilowatts. |                                       |
| 1  | United States.....         | 3,462               | 1,499,381                | 4,047         | 1,090,261  | 490       | 311,003    | 20,187                                |
| 2  | Alabama.....               | 27                  | 4,500                    | 9             | 3,400      |           |            | 256                                   |
| 3  | Arizona.....               | 15                  | 1,490                    | 9             | 1,190      | 2         | 300        |                                       |
| 4  | Arkansas.....              | 50                  |                          |               |            |           |            |                                       |
| 5  | California.....            | 115                 | 295,933                  | 1,061         | 283,055    | 8         | 2,130      | 1,156                                 |
| 6  | Colorado.....              | 49                  | 19,594                   | 90            | 18,910     | 1         | 400        | 284                                   |
| 7  | Connecticut.....           | 36                  | 16,520                   | 44            | 11,470     | 11        | 5,050      | 1,040                                 |
| 8  | Delaware.....              | 8                   | 24,795                   | 21            | 11,900     | 18        | 10,700     | 1,178                                 |
| 9  | Florida.....               | 24                  |                          |               |            |           |            |                                       |
| 10 | Georgia.....               | 34                  | 15,399                   | 35            | 14,299     | 4         | 600        |                                       |
| 11 | Idaho.....                 | 40                  | 4,225                    | 61            | 3,925      |           |            | 500                                   |
| 12 | Illinois.....              | 271                 | 89,060                   | 88            | 17,760     | 93        | 69,400     | 3,018                                 |
| 13 | Indiana.....               | 132                 | 23,611                   | 52            | 19,930     | 12        | 1,615      | 420                                   |
| 14 | Iowa.....                  | 141                 | 1,443                    | 28            | 1,411      |           |            |                                       |
| 15 | Kansas.....                | 79                  | 5,850                    | 28            | 5,850      |           |            |                                       |
| 16 | Kentucky.....              | 69                  | 1,200                    |               |            |           |            | 1,200                                 |
| 17 | Louisiana.....             | 21                  | 6,117                    | 10            | 2,117      | 4         | 3,000      |                                       |
| 18 | Maine.....                 | 77                  | 11,611                   | 55            | 11,611     |           |            | 1,000                                 |
| 19 | Maryland.....              | 28                  | 16,525                   | 26            | 5,725      | 9         | 7,400      |                                       |
| 20 | Massachusetts.....         | 96                  | 23,831                   | 154           | 22,919     | 3         | 900        | 3,400                                 |
| 21 | Michigan.....              | 130                 | 86,693                   | 128           | 60,008     | 28        | 9,290      | 1,388                                 |
| 22 | Minnesota.....             | 79                  | 53,292                   | 77            | 44,440     | 16        | 5,100      | 299                                   |
| 23 | Mississippi.....           | 29                  | 60                       | 2             | 60         |           |            | 17,395                                |
| 24 | Missouri.....              | 104                 | 35,272                   | 116           | 6,347      | 16        | 7,950      | 528                                   |
| 25 | Montana.....               | 31                  | 17,742                   | 54            | 16,602     | 2         | 600        | 936                                   |
| 26 | Nebraska.....              | 73                  | 890                      | 17            | 840        |           |            | 20,975                                |
| 27 | Nevada.....                | 9                   | 7,700                    | 34            | 7,700      |           |            | 540                                   |
| 28 | New Hampshire.....         | 52                  | 10,730                   | 57            | 9,780      | 3         | 750        | 50                                    |
| 29 | New Jersey.....            | 57                  | 9,070                    | 60            | 4,745      | 14        | 4,200      |                                       |
| 30 | New Mexico.....            | 15                  |                          |               |            |           |            | 278                                   |
| 31 | New York.....              | 267                 | 487,673                  | 860           | 316,637    | 196       | 161,628    | 200                                   |
| 32 | North Carolina.....        | 35                  | 2,070                    | 20            | 2,070      |           |            | 125                                   |
| 33 | North Dakota.....          | 21                  |                          |               |            |           |            |                                       |
| 34 | Ohio.....                  | 167                 | 18,708                   | 59            | 13,335     | 4         | 1,000      | 9,408                                 |
| 35 | Oklahoma.....              | 58                  |                          |               |            |           |            |                                       |
| 36 | Oregon.....                | 50                  | 40,579                   | 138           | 29,379     | 15        | 10,200     | 4,370                                 |
| 37 | Pennsylvania.....          | 282                 | 53,602                   | 183           | 35,987     | 23        | 5,440      | 1,000                                 |
| 38 | Rhode Island.....          | 6                   | 1,823                    | 26            | 1,823      |           |            |                                       |
| 39 | South Carolina.....        | 23                  | 47,567                   | 151           | 47,567     |           |            | 1,108                                 |
| 40 | South Dakota.....          | 29                  | 1,250                    | 5             | 1,250      |           |            | 296                                   |
| 41 | Tennessee.....             | 50                  | 249                      | 6             | 249        |           |            |                                       |
| 42 | Texas.....                 | 209                 | 1,140                    |               |            |           |            |                                       |
| 43 | Utah.....                  | 22                  | 8,540                    | 45            | 8,540      |           |            | 1,140                                 |
| 44 | Vermont.....               | 47                  | 8,510                    | 63            | 8,310      | 1         | 200        |                                       |
| 45 | Virginia.....              | 37                  | 2,055                    | 12            | 2,055      |           |            |                                       |
| 46 | Washington.....            | 65                  | 36,107                   | 110           | 32,957     | 7         | 3,150      | 55                                    |
| 47 | West Virginia.....         | 43                  | 1,805                    | 19            | 1,805      |           |            |                                       |
| 48 | Wisconsin.....             | 142                 | 4,503                    | 33            | 2,253      |           |            |                                       |
| 49 | Wyoming.....               | 18                  | 50                       | 1             | 50         |           |            | 2,250                                 |
| 50 | Alaska.....                | 9                   | 900                      | 6             | 900        |           |            |                                       |
| 51 | Hawaii and Porto Rico..... | 6                   |                          |               |            |           |            |                                       |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.



## GENERAL TABLES.

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FORMERS, METERS, CUSTOMERS, AND OUTPUT OF STATIONS, BY STATES AND TERRITORIES: 1907.

| STATIONARY MOTORS. |             | TRANSFORMERS IN CIRCUITS FOR CUSTOMERS. |            | Number of meters on consumption circuits. | Number of customers furnished electric current. | OUTPUT OF STATIONS, KILOWATT HOURS. |                  |    |
|--------------------|-------------|-----------------------------------------|------------|-------------------------------------------|-------------------------------------------------|-------------------------------------|------------------|----|
| Number.            | Horsepower. | Number.                                 | Kilowatts. |                                           |                                                 | Total for year.                     | Average per day. |    |
| 162,677            | 1,617,337   | 255,337                                 | 1,897,170  | 1,468,763                                 | 1,663,354                                       | 5,572,813,049                       | 15,484,889       | 1  |
| 499                | 5,412       | 1,388                                   | 6,944      | 9,256                                     | 12,176                                          | 27,908,886                          | 77,289           | 2  |
| 339                | 2,220       | 805                                     | 3,063      | 5,025                                     | 5,854                                           | 9,392,302                           | 25,731           | 3  |
| 192                | 1,167       | 1,547                                   | 6,388      | 5,549                                     | 9,311                                           | 9,240,827                           | 25,649           | 4  |
| 11,265             | 197,861     | 20,297                                  | 208,686    | 136,933                                   | 166,013                                         | 657,765,896                         | 1,805,187        | 5  |
| 3,217              | 41,028      | 3,795                                   | 44,863     | 40,047                                    | 45,519                                          | 122,766,944                         | 336,905          | 6  |
| 2,586              | 20,014      | 3,472                                   | 22,611     | 17,926                                    | 19,147                                          | 64,199,442                          | 175,934          | 7  |
| 1,629              | 13,049      | 1,482                                   | 7,838      | 11,371                                    | 10,094                                          | 29,368,587                          | 80,462           | 8  |
| 68                 | 669         | 1,070                                   | 3,769      | 2,729                                     | 4,596                                           | 4,358,763                           | 12,107           | 9  |
| 323                | 10,601      | 1,231                                   | 9,508      | 3,182                                     | 5,599                                           | 51,182,993                          | 140,784          | 10 |
| 385                | 4,002       | 1,936                                   | 10,017     | 6,710                                     | 12,143                                          | 9,080,453                           | 26,464           | 11 |
| 21,608             | 137,405     | 17,399                                  | 91,216     | 137,336                                   | 151,885                                         | 439,685,765                         | 1,207,866        | 12 |
| 4,725              | 30,374      | 8,636                                   | 48,215     | 52,644                                    | 60,866                                          | 106,317,599                         | 296,138          | 13 |
| 2,441              | 13,936      | 4,052                                   | 20,576     | 30,540                                    | 37,347                                          | 30,387,174                          | 83,489           | 14 |
| 1,214              | 10,957      | 2,215                                   | 12,342     | 16,949                                    | 22,839                                          | 53,069,247                          | 145,644          | 15 |
| 1,048              | 9,396       | 3,620                                   | 17,480     | 15,587                                    | 20,820                                          | 33,113,858                          | 92,006           | 16 |
| 1,696              | 16,065      | 2,783                                   | 6,978      | 12,685                                    | 12,244                                          | 22,433,161                          | 61,843           | 17 |
| 1,296              | 19,345      | 4,622                                   | 23,720     | 15,905                                    | 19,279                                          | 64,200,146                          | 184,702          | 18 |
| 4,848              | 19,391      | 3,662                                   | 21,596     | 20,422                                    | 21,462                                          | 45,558,955                          | 124,818          | 19 |
| 15,370             | 76,858      | 13,983                                  | 83,743     | 78,603                                    | 71,727                                          | 206,383,440                         | 566,043          | 20 |
| 6,761              | 51,236      | 6,174                                   | 57,049     | 54,931                                    | 60,096                                          | 178,698,930                         | 492,573          | 21 |
| 3,411              | 39,452      | 4,368                                   | 29,613     | 29,645                                    | 34,303                                          | 75,441,141                          | 336,217          | 22 |
| 154                | 1,213       | 889                                     | 6,162      | 5,235                                     | 7,456                                           | 8,558,823                           | 23,338           | 23 |
| 8,837              | 52,596      | 7,674                                   | 40,153     | 44,339                                    | 50,771                                          | 135,838,680                         | 374,769          | 24 |
| 961                | 33,236      | 1,695                                   | 33,411     | 14,800                                    | 17,265                                          | 137,066,091                         | 391,349          | 25 |
| 1,664              | 10,581      | 1,884                                   | 14,472     | 18,273                                    | 21,837                                          | 28,269,376                          | 77,510           | 26 |
| 411                | 6,850       | 836                                     | 4,319      | 2,305                                     | 3,958                                           | 29,621,730                          | 81,820           | 27 |
| 1,061              | 10,231      | 3,798                                   | 18,098     | 11,302                                    | 13,425                                          | 54,453,809                          | 151,353          | 28 |
| 5,974              | 27,523      | 13,548                                  | 55,616     | 53,949                                    | 55,756                                          | 139,357,377                         | 382,572          | 29 |
| 195                | 1,231       | 303                                     | 1,949      | 2,701                                     | 4,494                                           | 4,614,349                           | 12,680           | 30 |
| 17,938             | 393,004     | 30,539                                  | 499,982    | 211,062                                   | 194,351                                         | 1,441,317,340                       | 3,952,327        | 31 |
| 168                | 3,416       | 623                                     | 3,036      | 1,533                                     | 3,240                                           | 8,086,074                           | 22,426           | 32 |
| 312                | 1,770       | 232                                     | 1,356      | 5,182                                     | 6,460                                           | 7,210,255                           | 19,846           | 33 |
| 12,745             | 63,260      | 14,714                                  | 77,514     | 73,690                                    | 76,122                                          | 188,017,835                         | 517,054          | 34 |
| 1,078              | 6,561       | 1,965                                   | 11,094     | 13,019                                    | 18,505                                          | 23,057,560                          | 64,028           | 35 |
| 2,070              | 20,444      | 3,314                                   | 24,713     | 20,626                                    | 31,735                                          | 92,035,297                          | 253,477          | 36 |
| 9,955              | 121,671     | 36,125                                  | 190,454    | 136,854                                   | 152,921                                         | 402,666,869                         | 1,123,143        | 37 |
| 2,080              | 12,946      | 2,397                                   | 16,304     | 13,017                                    | 11,392                                          | 35,505,323                          | 97,275           | 38 |
| 898                | 36,937      | 1,597                                   | 9,441      | 4,465                                     | 5,403                                           | 66,654,585                          | 188,952          | 39 |
| 270                | 3,610       | 724                                     | 6,516      | 4,899                                     | 6,287                                           | 12,584,691                          | 37,377           | 40 |
| 1,175              | 4,244       | 2,253                                   | 10,347     | 9,565                                     | 11,547                                          | 27,493,009                          | 80,945           | 41 |
| 4,133              | 13,068      | 8,093                                   | 29,662     | 45,699                                    | 65,683                                          | 71,215,508                          | 197,948          | 42 |
| 325                | 4,979       | 665                                     | 6,831      | 1,601                                     | 7,292                                           | 57,824,411                          | 158,898          | 43 |
| 710                | 9,056       | 2,962                                   | 18,239     | 10,548                                    | 12,171                                          | 26,160,843                          | 71,840           | 44 |
| 170                | 2,826       | 831                                     | 6,048      | 1,861                                     | 4,655                                           | 7,799,819                           | 22,749           | 45 |
| 1,718              | 27,952      | 2,539                                   | 52,639     | 22,407                                    | 29,146                                          | 250,685,581                         | 688,581          | 46 |
| 338                | 4,392       | 1,984                                   | 10,092     | 5,890                                     | 9,034                                           | 23,157,102                          | 66,902           | 47 |
| 2,285              | 17,617      | 4,525                                   | 20,586     | 26,767                                    | 34,012                                          | 47,588,119                          | 133,899          | 48 |
| 131                | 685         | 271                                     | 1,901      | 3,199                                     | 5,116                                           | 5,499,064                           | 15,060           | 49 |
| 65                 | 557         | 538                                     | 1,614      | 734                                       | 1,879                                           | 3,390,401                           | 9,366            | 50 |
| 162                | 1,082       | 420                                     | 2,002      | 2,490                                     | 5,069                                           | 5,049,047                           | 13,833           | 51 |

\* Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 128.—COMMERCIAL CENTRAL ELECTRIC STATIONS—

| ARC LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |                     |            |             |           |         |           |                 |           |         |           |                      |           |         |           |
|-------------------------------------------------|---------------------|------------|-------------|-----------|---------|-----------|-----------------|-----------|---------|-----------|----------------------|-----------|---------|-----------|
| STATE OR TERRITORY.                             | Number of stations. | Aggregate. | Total.      |           |         |           | Direct-current. |           |         |           | Alternating-current. |           |         |           |
|                                                 |                     |            | Commercial. |           | Public. |           | Commercial.     |           | Public. |           | Commercial.          |           | Public. |           |
|                                                 |                     |            | Open.       | Inclosed. | Open.   | Inclosed. | Open.           | Inclosed. | Open.   | Inclosed. | Open.                | Inclosed. | Open.   | Inclosed. |
| United States.....                              | 3,462               | 472,773    | 11,581      | 244,883   | 48,875  | 167,434   | 9,696           | 125,150   | 47,207  | 54,066    | 1,885                | 119,733   | 1,668   | 113,368   |
| Alabama.....                                    | 27                  | 4,200      | 262         | 2,429     | 24      | 1,485     |                 | 1,775     | 2       | 85        | 262                  | 654       | 22      | 1,400     |
| Arizona.....                                    | 15                  | 754        | 78          | 409       | 27      | 240       | 6               | 106       | 9       | 27        | 72                   | 303       | 18      | 213       |
| Arkansas.....                                   | 50                  | 1,060      |             | 551       |         | 509       |                 | 20        |         | 109       |                      | 531       |         | 400       |
| California.....                                 | 115                 | 18,826     | 175         | 9,199     | 807     | 8,645     | 66              | 982       | 634     | 335       | 109                  | 8,217     | 173     | 8,310     |
| Colorado.....                                   | 49                  | 5,266      | 88          | 2,179     | 1,677   | 1,322     | 88              | 75        | 1,677   | 67        |                      | 2,104     |         | 1,255     |
| Connecticut.....                                | 36                  | 6,928      | 241         | 3,131     | 1,371   | 2,185     | 229             | 1,766     | 1,371   | 474       | 12                   | 1,365     |         | 1,711     |
| Delaware.....                                   | 8                   | 4,417      | 37          | 2,599     | 361     | 1,420     | 37              | 1,989     | 361     | 1,373     |                      | 610       |         | 47        |
| Florida.....                                    | 24                  | 388        |             | 78        | 43      | 267       |                 | 12        | 23      | 18        |                      | 66        | 20      | 249       |
| Georgia.....                                    | 34                  | 1,160      |             | 439       | 172     | 549       |                 | 30        | 103     | 52        |                      | 409       | 69      | 497       |
| Idaho.....                                      | 40                  | 889        |             | 359       | 24      | 506       |                 |           | 5       | 3         |                      | 359       | 19      | 503       |
| Illinois.....                                   | 271                 | 39,032     | 678         | 26,258    | 1,765   | 10,331    | 625             | 14,441    | 1,757   | 2,215     | 53                   | 11,817    | 8       | 8,116     |
| Indiana.....                                    | 132                 | 16,667     | 109         | 7,532     | 3,284   | 5,742     | 63              | 3,353     | 3,251   | 1,630     | 46                   | 4,179     | 33      | 4,112     |
| Iowa.....                                       | 141                 | 6,341      | 72          | 3,131     | 939     | 2,199     | 70              | 1,567     | 898     | 425       | 2                    | 1,564     | 41      | 1,774     |
| Kansas.....                                     | 79                  | 4,180      | 2           | 2,311     | 46      | 1,821     | 2               | 883       | 46      | 601       |                      | 1,428     |         | 1,220     |
| Kentucky.....                                   | 69                  | 5,578      |             | 1,355     | 36      | 4,187     |                 | 136       | 36      | 2,404     |                      | 1,219     |         | 1,783     |
| Louisiana.....                                  | 21                  | 7,979      |             | 4,368     |         | 3,611     |                 | 3,112     |         | 106       |                      | 1,256     |         | 3,505     |
| Maine.....                                      | 77                  | 2,565      | 15          | 1,091     | 114     | 1,345     | 15              | 290       | 114     | 550       |                      | 801       |         | 795       |
| Maryland.....                                   | 28                  | 8,577      | 383         | 5,381     | 1,072   | 1,741     | 383             | 3,138     | 1,072   | 1,523     |                      | 2,243     |         | 218       |
| Massachusetts.....                              | 96                  | 30,914     | 155         | 15,138    | 2,329   | 13,292    | 155             | 8,663     | 2,222   | 6,403     |                      | 6,475     | 107     | 6,889     |
| Michigan.....                                   | 130                 | 12,973     | 83          | 7,950     | 833     | 4,107     | 72              | 4,094     | 719     | 790       | 11                   | 3,856     | 114     | 3,317     |
| Minnesota.....                                  | 79                  | 11,012     | 7           | 7,445     | 1,422   | 2,138     | 7               | 4,969     | 1,343   | 401       |                      | 2,476     | 79      | 1,737     |
| Mississippi.....                                | 29                  | 857        | 14          | 306       | 31      | 506       |                 | 31        | 31      | 27        | 14                   | 275       | 31      | 479       |
| Missouri.....                                   | 104                 | 15,227     | 16          | 11,187    | 264     | 3,760     |                 | 6,673     | 225     | 2,878     | 16                   | 4,514     | 39      | 882       |
| Montana.....                                    | 31                  | 3,043      | 5           | 1,965     | 162     | 911       | 2               | 505       | 149     | 32        | 3                    | 1,460     | 13      | 879       |
| Nebraska.....                                   | 73                  | 3,320      | 13          | 1,898     | 11      | 1,398     |                 | 76        | 6       | 58        | 13                   | 1,822     | 5       | 1,340     |
| Nevada.....                                     | 9                   | 327        |             | 195       |         | 132       |                 |           |         |           |                      | 195       |         | 132       |
| New Hampshire.....                              | 52                  | 3,501      | 4           | 1,555     | 19      | 1,923     | 4               | 32        | 19      | 101       |                      | 1,523     |         | 1,822     |
| New Jersey.....                                 | 57                  | 21,798     | 8           | 8,806     | 2,642   | 10,342    | 8               | 442       | 2,295   | 2,569     |                      | 8,364     | 347     | 7,773     |
| New Mexico.....                                 | 15                  | 332        | 4           | 162       | 3       | 163       |                 | 59        |         | 26        | 4                    | 103       | 3       | 137       |
| New York.....                                   | 267                 | 94,240     | 397         | 56,794    | 3,849   | 33,200    | 392             | 42,178    | 3,835   | 15,308    | 5                    | 14,616    | 14      | 17,992    |
| North Carolina.....                             | 35                  | 417        |             | 81        |         | 336       |                 | 5         |         | 54        |                      | 76        |         | 282       |
| North Dakota.....                               | 21                  | 907        |             | 582       | 20      | 305       |                 | 505       | 20      | 116       |                      | 77        |         | 189       |
| Ohio.....                                       | 167                 | 34,332     | 3,264       | 14,486    | 3,236   | 13,346    | 2,236           | 9,936     | 2,949   | 3,601     | 1,028                | 4,550     | 287     | 9,745     |
| Oklahoma.....                                   | 58                  | 3,130      | 2           | 1,503     | 29      | 1,596     | 2               | 76        |         | 144       |                      | 1,427     | 29      | 1,452     |
| Oregon.....                                     | 50                  | 3,875      | 2           | 1,557     | 1,597   | 719       |                 | 9         | 1,597   |           | 2                    | 1,548     |         | 719       |
| Pennsylvania.....                               | 282                 | 62,627     | 4,929       | 23,524    | 17,182  | 16,992    | 4,801           | 8,058     | 17,067  | 7,690     | 128                  | 15,406    | 115     | 9,302     |
| Rhode Island.....                               | 6                   | 5,905      | 1           | 2,630     | 2,399   | 875       | 1               | 1,807     | 2,399   | 100       |                      | 823       |         | 775       |
| South Carolina.....                             | 23                  | 1,737      |             | 634       |         | 1,103     |                 |           |         | 87        |                      | 634       |         | 1,016     |
| South Dakota.....                               | 29                  | 967        | 15          | 466       |         | 486       |                 | 114       |         | 66        | 15                   | 352       |         | 420       |
| Tennessee.....                                  | 50                  | 2,679      |             | 1,338     | 9       | 1,332     |                 | 14        | 8       | 37        |                      | 1,324     | 1       | 1,295     |
| Texas.....                                      | 209                 | 7,123      | 44          | 4,522     | 375     | 2,182     | 35              | 838       | 367     | 109       | 9                    | 3,694     | 8       | 2,073     |
| Utah.....                                       | 22                  | 293        |             | 259       |         | 34        |                 |           |         |           |                      | 259       |         | 34        |
| Vermont.....                                    | 47                  | 1,522      | 61          | 447       | 198     | 816       | 3               |           | 198     | 64        | 58                   | 447       |         | 752       |
| Virginia.....                                   | 37                  | 721        |             | 319       | 37      | 365       |                 | 5         | 32      | 110       |                      | 314       | 5       | 265       |
| Washington.....                                 | 65                  | 4,550      |             | 2,948     |         | 1,602     |                 | 1,592     |         | 21        |                      | 1,356     |         | 1,581     |
| West Virginia.....                              | 43                  | 2,157      | 12          | 1,017     | 54      | 1,074     |                 | 63        | 81      | 48        | 12                   | 954       | 23      | 1,026     |
| Wisconsin.....                                  | 142                 | 6,963      | 405         | 2,107     | 340     | 4,111     | 394             | 651       | 295     | 1,198     | 11                   | 1,456     | 45      | 2,913     |
| Wyoming.....                                    | 18                  | 517        |             | 262       | 72      | 183       |                 | 80        | 72      | 31        |                      | 182       |         | 152       |
| Alaska.....                                     | 9                   | 67         | 1           | 63        |         | 3         | 1               | 11        |         | 3         |                      | 52        |         |           |
| Hawaii and Porto Rico.....                      | 6                   | 539        |             | 139       | 131     | 269       |                 | 39        | 131     | 112       |                      | 100       |         | 157       |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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## ANALYSIS OF SERVICE, BY STATES AND TERRITORIES: 1907.

| INCANDESCENT LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |             |         |                 |         |                 |         |                        |         | OTHER VARIETIES OF<br>L A M P S—NEONST,<br>VACUUM, V A P O R,<br>E T C. |         | STATIONARY MOTORS. |             |    |
|----------------------------------------------------------|-------------|---------|-----------------|---------|-----------------|---------|------------------------|---------|-------------------------------------------------------------------------|---------|--------------------|-------------|----|
| Aggregate.                                               | Total.      |         | 16-candlepower. |         | 32-candlepower. |         | All other candlepower. |         | Commercial.                                                             | Public. | Number.            | Horsepower. |    |
|                                                          | Commercial. | Public. | Commercial.     | Public. | Commercial.     | Public. | Commercial.            | Public. |                                                                         |         |                    |             |    |
| 37,393,549                                               | 36,755,093  | 638,456 | 31,679,031      | 474,209 | 1,156,203       | 86,212  | 3,919,859              | 78,035  | 148,884                                                                 | 4,584   | 162,677            | 1,617,337   | 1  |
| 190,354                                                  | 189,912     | 442     | 163,232         | 358     | 11,125          | 81      | 15,555                 | 3       | 67                                                                      | .....   | 499                | 5,412       | 2  |
| 72,001                                                   | 71,480      | 521     | 59,295          | 449     | 4,935           | 72      | 7,250                  | .....   | 27                                                                      | .....   | 339                | 2,220       | 3  |
| 115,134                                                  | 113,430     | 1,704   | 100,538         | 579     | 8,016           | 856     | 4,876                  | 289     | 79                                                                      | .....   | 192                | 1,167       | 4  |
| 2,956,174                                                | 2,924,367   | 31,807  | 2,390,419       | 26,685  | 94,032          | 3,640   | 439,916                | 1,482   | 669                                                                     | .....   | 11,265             | 197,861     | 5  |
| 632,470                                                  | 624,605     | 7,865   | 589,363         | 7,072   | 14,771          | 481     | 20,471                 | 312     | 735                                                                     | 280     | 3,217              | 41,028      | 6  |
| 523,484                                                  | 517,038     | 6,446   | 416,957         | 2,932   | 8,123           | 270     | 91,958                 | 3,244   | 9,926                                                                   | 285     | 2,586              | 20,014      | 7  |
| 403,023                                                  | 396,837     | 6,186   | 383,898         | 3,277   | 10,226          | 88      | 4,713                  | 821     | 3,282                                                                   | .....   | 1,629              | 13,049      | 8  |
| 53,089                                                   | 51,982      | 1,107   | 47,998          | 65      | 3,368           | 610     | 586                    | 432     | 26                                                                      | .....   | 68                 | 669         | 9  |
| 65,459                                                   | 64,224      | 1,235   | 55,146          | 929     | 6,233           | 170     | 2,845                  | 136     | 421                                                                     | .....   | 323                | 10,601      | 10 |
| 114,386                                                  | 113,519     | 867     | 88,528          | 209     | 6,438           | 582     | 18,553                 | 76      | 31                                                                      | .....   | 385                | 4,002       | 11 |
| 3,378,519                                                | 3,321,320   | 57,199  | 2,555,685       | 46,619  | 94,565          | 6,744   | 671,070                | 3,836   | 8,533                                                                   | 111     | 21,606             | 137,405     | 12 |
| 1,027,022                                                | 1,015,016   | 12,006  | 912,332         | 9,174   | 56,780          | 1,761   | 45,904                 | 1,071   | 2,823                                                                   | 2,400   | 4,725              | 30,374      | 13 |
| 667,283                                                  | 656,356     | 10,927  | 551,696         | 3,428   | 30,660          | 5,575   | 74,000                 | 1,924   | 831                                                                     | 66      | 2,441              | 13,936      | 14 |
| 392,456                                                  | 390,621     | 1,835   | 289,519         | 1,021   | 17,469          | 503     | 83,633                 | 311     | 687                                                                     | 20      | 1,214              | 10,957      | 15 |
| 428,975                                                  | 424,450     | 4,525   | 345,234         | 3,010   | 10,628          | 1,061   | 68,588                 | 454     | 245                                                                     | .....   | 1,048              | 9,396       | 16 |
| 332,894                                                  | 325,642     | 7,252   | 302,426         | 6,867   | 5,663           | 229     | 17,553                 | 156     | 227                                                                     | .....   | 1,696              | 16,065      | 17 |
| 434,134                                                  | 427,703     | 6,431   | 353,896         | 1,929   | 27,170          | 2,629   | 46,337                 | 1,873   | 252                                                                     | .....   | 1,296              | 19,345      | 18 |
| 623,073                                                  | 606,308     | 14,765  | 604,186         | 12,901  | 1,739           | 968     | 2,383                  | 896     | 4,824                                                                   | .....   | 4,848              | 19,391      | 19 |
| 2,427,431                                                | 2,390,402   | 37,029  | 2,273,972       | 15,644  | 50,647          | 3,574   | 65,783                 | 17,811  | 4,074                                                                   | 26      | 15,370             | 76,858      | 20 |
| 1,293,431                                                | 1,275,642   | 17,789  | 1,057,735       | 15,482  | 48,359          | 1,071   | 169,548                | 1,236   | 4,210                                                                   | 72      | 6,761              | 51,236      | 21 |
| 629,239                                                  | 617,851     | 11,388  | 552,306         | 7,763   | 16,639          | 1,708   | 48,906                 | 1,917   | 2,230                                                                   | 48      | 3,411              | 39,452      | 22 |
| 53,019                                                   | 52,347      | 672     | 43,480          | 1,556   | 5,137           | 382     | 3,730                  | 134     | 50                                                                      | .....   | 1,154              | 1,213       | 23 |
| 1,565,757                                                | 1,550,916   | 5,841   | 1,015,413       | 2,731   | 40,148          | 2,826   | 504,355                | 284     | 6,399                                                                   | 4       | 8,837              | 62,596      | 24 |
| 226,073                                                  | 224,527     | 1,546   | 205,002         | 1,447   | 11,105          | 94      | 8,420                  | 5       | 324                                                                     | .....   | 961                | 33,236      | 25 |
| 407,705                                                  | 404,161     | 3,544   | 311,787         | 1,964   | 12,048          | 1,480   | 80,326                 | 100     | 1,000                                                                   | .....   | 1,664              | 10,581      | 26 |
| 63,904                                                   | 63,684      | 220     | 60,175          | 215     | 1,330           | 5       | 2,179                  | .....   | 20                                                                      | 15      | 411                | 6,850       | 27 |
| 287,728                                                  | 279,359     | 8,369   | 254,154         | 4,794   | 5,339           | 1,835   | 19,866                 | 1,740   | 434                                                                     | .....   | 1,061              | 10,231      | 28 |
| 1,644,928                                                | 1,622,022   | 22,906  | 1,291,647       | 3,323   | 201,519         | 7,422   | 128,856                | 12,161  | 1,827                                                                   | 12      | 5,974              | 27,523      | 29 |
| 55,229                                                   | 54,537      | 692     | 37,177          | 625     | 6,817           | 66      | 10,543                 | 1       | 150                                                                     | .....   | 195                | 1,231       | 30 |
| 6,807,677                                                | 6,576,105   | 231,572 | 6,329,122       | 212,893 | 56,058          | 3,305   | 190,925                | 15,374  | 25,413                                                                  | 77      | 17,938             | 393,004     | 31 |
| 45,456                                                   | 44,613      | 843     | 36,829          | 46      | 1,803           | 538     | 5,981                  | 259     | 12                                                                      | 51      | 168                | 3,416       | 32 |
| 95,271                                                   | 93,754      | 1,517   | 63,925          | 892     | 8,719           | 423     | 21,110                 | 202     | 258                                                                     | .....   | 312                | 1,770       | 33 |
| 1,993,288                                                | 1,860,084   | 33,204  | 1,562,684       | 29,027  | 53,933          | 2,925   | 243,467                | 1,252   | 12,955                                                                  | 303     | 12,745             | 63,260      | 34 |
| 201,271                                                  | 199,784     | 1,487   | 190,597         | 1,066   | 5,951           | 387     | 3,236                  | 34      | 648                                                                     | .....   | 1,078              | 6,561       | 35 |
| 359,947                                                  | 354,864     | 5,083   | 281,993         | 2,822   | 37,073          | 2,018   | 35,798                 | 243     | 2,752                                                                   | .....   | 2,070              | 20,444      | 36 |
| 3,733,412                                                | 3,701,041   | 32,371  | 3,226,477       | 20,752  | 80,952          | 6,969   | 393,612                | 4,650   | 36,121                                                                  | 243     | 9,955              | 121,671     | 37 |
| 382,589                                                  | 373,148     | 9,441   | 270,317         | 3,210   | 11,862          | 5,927   | 90,969                 | 304     | 606                                                                     | 100     | 2,080              | 12,946      | 38 |
| 103,283                                                  | 102,348     | 935     | 93,154          | 681     | 6,607           | 194     | 2,587                  | 60      | 104                                                                     | 1       | 898                | 36,937      | 39 |
| 93,476                                                   | 92,359      | 1,117   | 86,544          | 611     | 3,652           | 464     | 2,163                  | 42      | 147                                                                     | .....   | 270                | 3,610       | 40 |
| 253,662                                                  | 251,355     | 2,307   | 229,864         | 1,308   | 4,371           | 565     | 17,120                 | 434     | 65                                                                      | .....   | 1,175              | 4,244       | 41 |
| 768,160                                                  | 763,109     | 5,051   | 739,631         | 3,468   | 10,823          | 1,201   | 12,655                 | 382     | 9,183                                                                   | 168     | 4,133              | 18,068      | 42 |
| 44,993                                                   | 43,401      | 1,592   | 35,506          | 257     | 3,173           | 1,315   | 4,722                  | 20      | .....                                                                   | .....   | 325                | 4,979       | 43 |
| 242,457                                                  | 231,708     | 10,749  | 215,275         | 1,986   | 2,466           | 7,962   | 13,967                 | 801     | 195                                                                     | 220     | 710                | 9,056       | 44 |
| 62,697                                                   | 61,556      | 1,141   | 50,832          | 332     | 5,926           | 661     | 4,798                  | 148     | 600                                                                     | .....   | 170                | 2,826       | 45 |
| 403,587                                                  | 397,433     | 6,134   | 214,199         | 4,299   | 28,206          | 1,512   | 155,028                | 323     | 2,436                                                                   | .....   | 1,718              | 27,952      | 46 |
| 156,692                                                  | 153,756     | 2,936   | 137,450         | 1,572   | 7,363           | 954     | 8,943                  | 410     | 479                                                                     | .....   | 338                | 4,392       | 47 |
| 621,962                                                  | 612,954     | 9,008   | 551,518         | 6,654   | 13,001          | 1,942   | 48,435                 | 412     | 2,187                                                                   | 43      | 2,285              | 17,617      | 48 |
| 59,315                                                   | 58,463      | 852     | 49,918          | 685     | 3,205           | 187     | 5,340                  | .....   | 320                                                                     | 39      | 131                | 685         | 49 |
| 19,818                                                   | 19,500      | 318     | 14,850          | 216     | 1,355           | 98      | 3,295                  | 4       | 20                                                                      | .....   | 65                 | 587         | 50 |
| 58,492                                                   | 57,136      | 1,356   | 47,457          | 910     | 3,083           | 353     | 6,596                  | 93      | 12                                                                      | .....   | 162                | 1,082       | 51 |

\* Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 129.—COMMERCIAL CENTRAL ELECTRIC STATIONS—CHARACTER OF OWNERSHIP, SERVICE,

| STATE OR TERRITORY. |                                        | NUMBER OF STATIONS. |                         |       |                                     |                          |                      |                       |              |                       |              |                                      |                                                | Stocks and bonds outstanding, par value. | CAPITAL STOCK. |                   |              |  |
|---------------------|----------------------------------------|---------------------|-------------------------|-------|-------------------------------------|--------------------------|----------------------|-----------------------|--------------|-----------------------|--------------|--------------------------------------|------------------------------------------------|------------------------------------------|----------------|-------------------|--------------|--|
|                     |                                        | Total.              | Character of ownership. |       |                                     | Class.                   |                      | Character of service. |              |                       |              |                                      |                                                |                                          | Total.         |                   |              |  |
|                     |                                        |                     | Indi-<br>vid-<br>ual.   | Firm. | Cor-<br>pora-<br>tion. <sup>1</sup> | Purely<br>elec-<br>tric. | Com-<br>pos-<br>ite. | Lighting.             |              |                       |              | Sta-<br>tion-<br>ary<br>mot-<br>ors. | All<br>other<br>elec-<br>tric<br>serv-<br>ice. |                                          | Par value.     |                   |              |  |
|                     |                                        |                     |                         |       |                                     |                          |                      | Arc.                  |              | Incandes-<br>cent.    |              |                                      |                                                |                                          | Authorized.    | Outstand-<br>ing. | Dividends.   |  |
|                     |                                        |                     |                         |       |                                     |                          |                      | Com-<br>mer-<br>cial. | Pub-<br>lic. | Com-<br>mer-<br>cial. | Pub-<br>lic. |                                      |                                                |                                          |                |                   |              |  |
| 1                   | United States.....                     | 3,462               | 609                     | 298   | 2,555                               | 2,127                    | 1,335                | 1,840                 | 2,206        | 3,385                 | 2,327        | 1,659                                | 831                                            | \$1,341,995,182                          | \$900,092,160  | \$741,317,497     | \$19,300,572 |  |
| 2                   | Alabama.....                           | 27                  | 3                       | 1     | 23                                  | 11                       | 16                   | 19                    | 23           | 27                    | 8            | 18                                   | 7                                              | 8,123,250                                | 4,646,400      | 4,338,150         | 32,414       |  |
| 3                   | Arizona.....                           | 15                  | .....                   | 1     | 14                                  | 6                        | 9                    | 13                    | 11           | 14                    | 7            | 11                                   | 5                                              | 3,205,700                                | 2,950,000      | 2,297,800         | 27,200       |  |
| 4                   | Arkansas.....                          | 50                  | 12                      | 7     | 31                                  | 18                       | 32                   | 22                    | 31           | 50                    | 37           | 14                                   | 17                                             | 1,886,600                                | 1,356,200      | 1,074,600         | 8,000        |  |
| 5                   | California.....                        | 115                 | 21                      | 8     | 86                                  | 61                       | 54                   | 51                    | 57           | 114                   | 76           | 81                                   | 51                                             | 185,875,100                              | 116,616,500    | 101,279,733       | 910,114      |  |
| 6                   | Colorado.....                          | 49                  | 7                       | 1     | 41                                  | 37                       | 12                   | 33                    | 36           | 48                    | 31           | 35                                   | 11                                             | 26,086,660                               | 14,305,500     | 13,789,110        | 151,340      |  |
| 7                   | Connecticut.....                       | 36                  | 2                       | ..... | 34                                  | 21                       | 15                   | 16                    | 21           | 33                    | 25           | 26                                   | 12                                             | 12,924,150                               | 13,615,300     | 7,908,775         | 377,304      |  |
| 8                   | Delaware <sup>2</sup> .....            | 8                   | .....                   | ..... | 8                                   | 6                        | 2                    | 3                     | 3            | 8                     | 6            | 4                                    | 3                                              | 12,629,450                               | 7,055,000      | 6,908,850         | 400,000      |  |
| 9                   | Florida.....                           | 24                  | 5                       | 2     | 17                                  | 5                        | 19                   | 8                     | 17           | 24                    | 18           | 7                                    | 4                                              | 1,832,543                                | 1,441,000      | 1,345,100         | .....        |  |
| 10                  | Georgia.....                           | 34                  | 4                       | 2     | 28                                  | 18                       | 16                   | 13                    | 25           | 31                    | 21           | 16                                   | 5                                              | 8,891,850                                | 13,330,350     | 5,362,350         | 67,427       |  |
| 11                  | Idaho.....                             | 40                  | 9                       | 4     | 27                                  | 27                       | 13                   | 22                    | 26           | 40                    | 24           | 24                                   | 8                                              | 7,479,809                                | 6,653,500      | 6,521,380         | 40,306       |  |
| 12                  | Illinois.....                          | 271                 | 77                      | 38    | 156                                 | 186                      | 85                   | 166                   | 201          | 271                   | 187          | 102                                  | 45                                             | 101,802,550                              | 66,845,600     | 60,798,750        | 1,914,106    |  |
| 13                  | Indiana.....                           | 132                 | 24                      | 16    | 92                                  | 61                       | 71                   | 81                    | 94           | 132                   | 59           | 56                                   | 19                                             | 28,446,123                               | 16,138,000     | 13,158,173        | 158,846      |  |
| 14                  | Iowa.....                              | 141                 | 35                      | 14    | 92                                  | 99                       | 42                   | 87                    | 92           | 141                   | 122          | 64                                   | 45                                             | 13,970,500                               | 9,782,250      | 8,726,500         | 133,360      |  |
| 15                  | Kansas.....                            | 79                  | 12                      | 15    | 52                                  | 41                       | 38                   | 52                    | 59           | 79                    | 47           | 39                                   | 36                                             | 7,877,600                                | 6,192,800      | 4,984,100         | 44,025       |  |
| 16                  | Kentucky.....                          | 69                  | 11                      | 5     | 53                                  | 43                       | 26                   | 36                    | 52           | 69                    | 36           | 20                                   | 7                                              | 11,061,300                               | 7,002,200      | 5,315,700         | 143,965      |  |
| 17                  | Louisiana.....                         | 21                  | 3                       | 1     | 17                                  | 12                       | 9                    | 13                    | 14           | 21                    | 11           | 13                                   | 9                                              | 4,377,700                                | 2,043,500      | 1,814,700         | 29,300       |  |
| 18                  | Maine.....                             | 77                  | 7                       | 4     | 66                                  | 49                       | 28                   | 27                    | 30           | 72                    | 65           | 37                                   | 16                                             | 15,909,655                               | 9,826,040      | 8,340,655         | 143,940      |  |
| 19                  | Maryland.....                          | 28                  | 4                       | ..... | 24                                  | 18                       | 10                   | 15                    | 14           | 28                    | 26           | 11                                   | 2                                              | 46,451,773                               | 27,325,283     | 18,160,273        | 451,285      |  |
| 20                  | Massachusetts.....                     | 96                  | 6                       | 4     | 86                                  | 56                       | 37                   | 58                    | 70           | 93                    | 83           | 66                                   | 30                                             | 47,476,500                               | 46,154,800     | 43,655,500        | 3,592,235    |  |
| 21                  | Michigan.....                          | 130                 | 31                      | 18    | 81                                  | 76                       | 54                   | 72                    | 97           | 128                   | 93           | 52                                   | 36                                             | 37,396,162                               | 29,050,000     | 22,100,762        | 517,396      |  |
| 22                  | Minnesota.....                         | 79                  | 15                      | 11    | 53                                  | 39                       | 40                   | 49                    | 66           | 76                    | 62           | 43                                   | 21                                             | 33,428,215                               | 17,499,700     | 13,782,465        | 302,491      |  |
| 23                  | Mississippi.....                       | 29                  | 4                       | 2     | 23                                  | 16                       | 13                   | 16                    | 17           | 29                    | 17           | 11                                   | 18                                             | 1,179,250                                | 1,345,000      | 1,064,250         | 18,003       |  |
| 24                  | Missouri.....                          | 104                 | 32                      | 7     | 65                                  | 61                       | 43                   | 47                    | 64           | 102                   | 72           | 34                                   | 14                                             | 53,654,048                               | 36,353,911     | 22,743,548        | 963,240      |  |
| 25                  | Montana.....                           | 31                  | 2                       | 2     | 27                                  | 19                       | 12                   | 18                    | 17           | 28                    | 13           | 18                                   | 9                                              | 19,822,200                               | 15,206,000     | 12,618,700        | 254,350      |  |
| 26                  | Nebraska.....                          | 73                  | 28                      | 5     | 40                                  | 54                       | 19                   | 34                    | 48           | 73                    | 53           | 22                                   | 10                                             | 10,417,850                               | 7,900,950      | 6,599,250         | 60,093       |  |
| 27                  | Nevada.....                            | 9                   | .....                   | 2     | 7                                   | 4                        | 5                    | 4                     | 5            | 9                     | 4            | 4                                    | 3                                              | 5,113,500                                | 4,450,000      | 4,333,500         | 39,000       |  |
| 28                  | New Hampshire.....                     | 52                  | 4                       | 3     | 45                                  | 42                       | 10                   | 24                    | 22           | 50                    | 45           | 28                                   | 15                                             | 10,366,900                               | 6,830,000      | 6,486,400         | 310,204      |  |
| 29                  | New Jersey.....                        | 57                  | 6                       | 1     | 50                                  | 40                       | 17                   | 28                    | 38           | 57                    | 51           | 28                                   | 21                                             | 45,291,240                               | 33,355,800     | 19,401,990        | 422,736      |  |
| 30                  | New Mexico.....                        | 15                  | 2                       | ..... | 13                                  | 7                        | 8                    | 10                    | 10           | 14                    | 8            | 6                                    | 8                                              | 1,507,500                                | 1,140,000      | 752,500           | 9,000        |  |
| 31                  | New York.....                          | 267                 | 37                      | 12    | 218                                 | 189                      | 78                   | 112                   | 141          | 253                   | 197          | 138                                  | 36                                             | 293,037,642                              | 162,561,303    | 138,957,840       | 4,041,549    |  |
| 32                  | North Carolina.....                    | 35                  | 5                       | 7     | 23                                  | 18                       | 17                   | 8                     | 19           | 30                    | 23           | 16                                   | 4                                              | 1,571,100                                | 2,325,500      | 1,202,000         | 17,800       |  |
| 33                  | North Dakota.....                      | 21                  | 6                       | 2     | 13                                  | 9                        | 12                   | 17                    | 17           | 21                    | 15           | 11                                   | 5                                              | 2,010,300                                | 1,580,000      | 1,276,300         | 49,480       |  |
| 34                  | Ohio.....                              | 167                 | 36                      | 16    | 115                                 | 103                      | 64                   | 102                   | 127          | 167                   | 98           | 73                                   | 49                                             | 49,813,950                               | 46,466,600     | 38,412,350        | 843,625      |  |
| 35                  | Oklahoma.....                          | 58                  | 8                       | 3     | 47                                  | 25                       | 33                   | 46                    | 53           | 58                    | 36           | 30                                   | 18                                             | 8,905,875                                | 6,886,000      | 4,959,875         | 45,860       |  |
| 36                  | Oregon.....                            | 50                  | 12                      | 7     | 31                                  | 27                       | 23                   | 22                    | 34           | 49                    | 35           | 17                                   | 18                                             | 14,400,300                               | 7,470,500      | 6,946,800         | 132,960      |  |
| 37                  | Pennsylvania.....                      | 282                 | 22                      | 5     | 255                                 | 243                      | 39                   | 169                   | 171          | 272                   | 178          | 180                                  | 77                                             | 108,323,447                              | 62,045,973     | 58,472,228        | 1,534,487    |  |
| 38                  | Rhode Island.....                      | 6                   | .....                   | ..... | 6                                   | 4                        | 2                    | 5                     | 5            | 6                     | 6            | 6                                    | 4                                              | 7,170,000                                | 9,600,000      | 5,910,000         | 312,500      |  |
| 39                  | South Carolina.....                    | 23                  | 2                       | 2     | 19                                  | 12                       | 11                   | 12                    | 17           | 22                    | 16           | 15                                   | 5                                              | 13,140,160                               | 13,469,500     | 10,931,160        | 13,094       |  |
| 40                  | South Dakota.....                      | 29                  | 6                       | 3     | 20                                  | 19                       | 10                   | 15                    | 23           | 29                    | 22           | 6                                    | 2                                              | 4,563,250                                | 3,324,000      | 3,069,250         | 3,866        |  |
| 41                  | Tennessee.....                         | 50                  | 12                      | 7     | 31                                  | 29                       | 21                   | 18                    | 27           | 48                    | 32           | 14                                   | 6                                              | 6,664,050                                | 3,985,500      | 3,927,250         | 1,125        |  |
| 42                  | Texas.....                             | 209                 | 42                      | 27    | 140                                 | 86                       | 123                  | 86                    | 67           | 209                   | 96           | 86                                   | 47                                             | 12,932,012                               | 11,545,900     | 9,027,012         | 230,191      |  |
| 43                  | Utah.....                              | 22                  | .....                   | 1     | 21                                  | 16                       | 6                    | 8                     | 5            | 21                    | 5            | 12                                   | 6                                              | 4,308,838                                | 3,972,000      | 2,603,588         | 38,132       |  |
| 44                  | Vermont.....                           | 47                  | 7                       | 4     | 36                                  | 37                       | 10                   | 18                    | 21           | 45                    | 38           | 23                                   | 11                                             | 7,836,725                                | 5,094,000      | 4,794,225         | 38,481       |  |
| 45                  | Virginia.....                          | 37                  | 9                       | 5     | 23                                  | 26                       | 11                   | 9                     | 19           | 36                    | 23           | 16                                   | 4                                              | 1,393,500                                | 866,500        | 793,500           | 7,761        |  |
| 46                  | Washington.....                        | 65                  | 3                       | 5     | 57                                  | 38                       | 27                   | 41                    | 46           | 63                    | 50           | 37                                   | 11                                             | 21,108,330                               | 18,698,400     | 12,760,330        | 267,293      |  |
| 47                  | West Virginia.....                     | 43                  | 3                       | 1     | 39                                  | 25                       | 18                   | 24                    | 33           | 42                    | 37           | 15                                   | 9                                              | 3,549,325                                | 3,899,000      | 2,495,025         | 62,160       |  |
| 48                  | Wisconsin.....                         | 142                 | 33                      | 17    | 92                                  | 71                       | 71                   | 79                    | 105          | 135                   | 102          | 66                                   | 31                                             | 15,636,925                               | 8,486,000      | 8,347,425         | 83,808       |  |
| 49                  | Wyoming.....                           | 18                  | .....                   | ..... | 18                                  | 14                       | 4                    | 12                    | 16           | 18                    | 9            | 8                                    | 1                                              | 1,142,775                                | 1,344,000      | 764,775           | 4,500        |  |
| 50                  | Alaska.....                            | 9                   | .....                   | ..... | 9                                   | 5                        | 4                    | 8                     | 1            | 9                     | 7            | 6                                    | .....                                          | 770,800                                  | 880,000        | 705,800           | 13,500       |  |
| 51                  | Hawaland Porto Rico <sup>2</sup> ..... | 6                   | .....                   | 1     | 5                                   | 2                        | 4                    | 4                     | 6            | 6                     | 6            | 4                                    | 3                                              | 845,940                                  | 1,388,100      | 845,940           | 71,749       |  |

<sup>1</sup> Includes "Other forms of ownership," in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.

## CAPITALIZATION, AND COST OF CONSTRUCTION AND EQUIPMENT, BY STATES AND TERRITORIES: 1907.

| CAPITAL STOCK—continued. |               |              |               |              |             | BONDS.        |               |              | COST OF CONSTRUCTION AND EQUIPMENT. |                  |    |
|--------------------------|---------------|--------------|---------------|--------------|-------------|---------------|---------------|--------------|-------------------------------------|------------------|----|
| Common.                  |               |              | Preferred.    |              |             |               |               |              |                                     |                  |    |
| Par value.               |               | Dividends.   | Par value.    |              | Dividends.  | Par value.    |               | Interest.    | Total.                              | During the year. |    |
| Authorized.              | Outstanding.  |              | Authorized.   | Outstanding. |             | Authorized.   | Outstanding.  |              |                                     |                  |    |
| \$798,873,386            | \$666,003,772 | \$16,883,812 | \$101,218,774 | \$75,313,725 | \$2,416,760 | \$815,516,672 | \$600,677,685 | \$26,842,330 | \$1,054,034,175                     | \$95,746,208     | 1  |
| 4,096,400                | 3,788,150     | 2,414        | 550,000       | 550,000      | 30,000      | 6,560,000     | 3,785,100     | 195,846      | 6,804,059                           | 408,721          | 2  |
| 2,225,000                | 1,697,800     | 7,200        | 725,000       | 600,000      | 20,000      | 1,527,900     | 908,900       | 50,003       | 1,672,589                           | 180,380          | 3  |
| 1,356,200                | 1,074,600     | 8,000        |               |              |             | 860,000       | 812,000       | 37,400       | 1,505,602                           | 99,945           | 4  |
| 101,016,500              | 86,422,033    | 685,438      | 15,600,000    | 14,857,700   | 224,676     | 108,070,000   | 84,585,367    | 4,204,320    | 110,871,577                         | 8,849,652        | 5  |
| 11,605,500               | 11,341,610    | 137,340      | 2,700,000     | 2,447,500    | 14,000      | 16,865,000    | 12,297,550    | 634,009      | 23,005,536                          | 2,005,800        | 6  |
| 13,400,300               | 7,693,775     | 377,304      | 215,000       | 215,000      |             | 9,415,000     | 5,015,375     | 226,364      | 12,696,303                          | 886,146          | 7  |
| 6,555,000                | 6,408,850     | 380,000      | 500,000       | 500,000      | 20,000      | 8,850,000     | 5,720,600     | 224,400      | 12,626,298                          | 1,162,492        | 8  |
| 1,391,000                | 1,295,100     |              | 50,000        | 50,000       |             | 556,500       | 487,443       | 29,706       | 811,195                             | 56,395           | 9  |
| 11,785,350               | 4,967,350     | 64,727       | 1,545,000     | 395,000      | 2,700       | 13,771,000    | 3,529,500     | 183,065      | 6,226,692                           | 178,335          | 10 |
| 6,653,500                | 6,521,380     | 40,306       |               |              |             | 1,320,729     | 958,429       | 56,914       | 3,203,567                           | 587,200          | 11 |
| 64,295,100               | 58,298,250    | 1,808,496    | 2,550,500     | 2,500,500    | 105,610     | 53,087,000    | 41,003,800    | 1,782,357    | 82,195,708                          | 7,900,051        | 12 |
| 14,773,000               | 12,433,473    | 147,174      | 1,365,000     | 724,700      | 11,672      | 27,409,800    | 15,287,950    | 693,939      | 23,427,532                          | 1,894,947        | 13 |
| 8,479,250                | 7,639,500     | 104,860      | 1,303,000     | 1,087,080    | 28,500      | 6,358,500     | 5,244,000     | 265,228      | 8,953,989                           | 1,175,368        | 14 |
| 6,092,800                | 4,984,100     | 44,025       | 100,000       |              |             | 4,925,000     | 2,893,500     | 151,150      | 5,842,608                           | 566,343          | 15 |
| 7,002,200                | 5,315,700     | 143,965      |               |              |             | 8,385,500     | 5,745,600     | 270,335      | 9,831,444                           | 837,167          | 16 |
| 2,043,500                | 1,814,700     | 29,300       |               |              |             | 2,740,000     | 2,563,000     | 83,664       | 11,137,261                          | 301,804          | 17 |
| 8,264,140                | 7,063,155     | 114,838      | 1,561,900     | 1,277,500    | 29,102      | 9,138,000     | 7,569,000     | 311,832      | 12,443,798                          | 490,082          | 18 |
| 14,358,509               | 10,000,219    | 1,200        | 12,966,774    | 8,160,054    | 450,085     | 40,257,500    | 28,291,500    | 1,191,571    | 21,036,679                          | 2,914,439        | 19 |
| 46,127,300               | 43,628,000    | 3,580,428    | 27,500        | 27,500       | 1,807       | 4,197,500     | 3,821,000     | 186,644      | 40,523,245                          | 4,613,916        | 20 |
| 21,680,000               | 19,080,012    | 304,185      | 7,370,000     | 3,020,750    | 153,211     | 25,836,400    | 15,295,400    | 749,258      | 32,656,235                          | 3,761,219        | 21 |
| 15,299,700               | 11,644,465    | 182,491      | 2,200,000     | 2,138,000    | 120,000     | 28,118,000    | 19,645,750    | 672,287      | 22,192,753                          | 2,632,701        | 22 |
| 1,345,000                | 1,064,250     | 18,003       |               |              |             | 115,000       | 115,000       | 6,550        | 1,321,554                           | 115,658          | 23 |
| 33,303,911               | 19,693,548    | 838,240      | 3,050,000     | 3,050,000    | 125,000     | 32,270,000    | 30,910,500    | 1,536,190    | 32,554,571                          | 2,209,581        | 24 |
| 13,906,000               | 11,364,700    | 187,570      | 1,300,000     | 1,254,000    | 66,780      | 14,845,000    | 7,203,500     | 365,233      | 17,903,167                          | 1,151,941        | 25 |
| 6,898,450                | 6,114,950     | 35,928       | 1,002,500     | 484,300      | 24,165      | 4,649,600     | 3,818,600     | 178,608      | 6,863,096                           | 713,977          | 26 |
| 4,450,000                | 4,333,500     | 39,000       |               |              |             | 780,000       | 780,000       | 46,800       | 4,299,631                           | 107,953          | 27 |
| 6,560,000                | 6,256,400     | 301,204      | 270,000       | 230,000      | 9,000       | 4,157,100     | 3,890,500     | 200,250      | 8,618,803                           | 279,300          | 28 |
| 33,000,800               | 19,076,990    | 406,236      | 355,000       | 325,000      | 16,500      | 27,655,000    | 25,889,250    | 890,546      | 64,961,012                          | 3,834,018        | 29 |
| 1,040,000                | 752,500       | 9,000        | 100,000       |              |             | 1,061,000     | 755,000       | 18,323       | 989,317                             | 93,518           | 30 |
| 146,751,203              | 126,563,202   | 3,750,569    | 15,840,000    | 12,394,638   | 291,000     | 187,266,760   | 154,079,802   | 6,399,290    | 251,199,662                         | 23,403,555       | 31 |
| 2,325,500                | 1,202,000     | 17,800       |               |              |             | 519,100       | 369,100       | 18,708       | 1,425,512                           | 159,795          | 32 |
| 1,480,000                | 1,176,300     | 43,680       | 100,000       | 100,000      | 6,000       | 980,000       | 734,000       | 39,000       | 1,474,985                           | 152,414          | 33 |
| 32,530,600               | 30,117,750    | 475,547      | 13,936,000    | 8,294,600    | 418,078     | 17,258,500    | 11,401,600    | 560,674      | 39,132,506                          | 3,572,162        | 34 |
| 5,916,000                | 4,391,875     | 29,420       | 970,000       | 568,000      | 16,440      | 4,897,000     | 3,946,000     | 211,455      | 6,928,514                           | 565,491          | 35 |
| 6,258,000                | 5,734,300     | 72,335       | 1,212,500     | 1,212,500    | 60,625      | 12,215,000    | 7,453,500     | 354,162      | 14,281,632                          | 1,657,903        | 36 |
| 59,942,873               | 57,292,078    | 1,497,191    | 2,103,100     | 1,180,150    | 37,296      | 80,795,433    | 49,851,219    | 2,223,500    | 72,210,665                          | 6,686,401        | 37 |
| 9,100,000                | 5,510,000     | 298,500      | 500,000       | 400,000      | 14,000      | 1,710,000     | 1,260,000     | 61,850       | 7,285,943                           | 632,307          | 38 |
| 8,074,500                | 6,999,660     | 7,844        | 5,425,000     | 3,931,500    | 5,250       | 3,365,000     | 2,209,000     | 106,724      | 8,390,856                           | 1,612,097        | 39 |
| 2,761,500                | 2,506,750     | 3,666        | 562,500       | 562,500      | 200         | 2,375,000     | 1,494,000     | 72,600       | 2,607,668                           | 170,395          | 40 |
| 3,985,500                | 3,927,250     | 1,125        |               |              |             | 2,816,500     | 2,736,800     | 110,464      | 6,672,899                           | 883,711          | 41 |
| 10,783,400               | 8,277,012     | 192,691      | 762,500       | 750,000      | 37,500      | 4,804,000     | 3,905,000     | 190,598      | 10,905,677                          | 1,616,022        | 42 |
| 3,772,000                | 2,495,755     | 36,469       | 200,000       | 110,833      | 1,663       | 1,930,000     | 1,702,250     | 99,482       | 4,813,440                           | 559,483          | 43 |
| 5,034,000                | 4,762,225     | 38,381       | 60,000        | 32,000       | 100         | 3,911,050     | 3,042,500     | 145,760      | 6,652,907                           | 406,181          | 44 |
| 839,500                  | 786,500       | 7,201        | 27,000        | 7,000        | 560         | 690,000       | 600,000       | 13,200       | 1,338,257                           | 157,215          | 45 |
| 17,098,400               | 11,347,830    | 192,293      | 1,600,000     | 1,412,500    | 75,000      | 16,012,000    | 8,348,000     | 422,112      | 18,621,544                          | 2,444,556        | 46 |
| 3,889,000                | 2,485,025     | 62,160       | 10,000        | 10,000       |             | 1,501,300     | 1,054,300     | 53,885       | 2,582,063                           | 362,314          | 47 |
| 8,033,000                | 7,894,425     | 83,568       | 453,000       | 453,000      | 240         | 8,137,000     | 7,299,500     | 296,011      | 9,381,298                           | 629,128          | 48 |
| 1,294,000                | 764,775       | 4,500        | 50,000        |              |             | 551,000       | 378,000       | 20,073       | 942,326                             | 65,949           | 49 |
| 860,000                  | 705,800       | 13,500       |               |              |             | 65,000        | 65,000        | 3,250        | 626,837                             | 227,955          | 50 |
| 1,388,100                | 845,940       | 71,749       |               |              |             |               |               |              | 632,936                             | 5,509            | 51 |

\* Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 130.—COMMERCIAL CENTRAL ELECTRIC STATIONS—CONDENSED STATEMENT: INCOME AND EXPENSES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.        | Number of stations. | INCOME.       |                   |               |                    |              |                    | EXPENSES.    |                     |                                        |                                                            |
|----------------------------|---------------------|---------------|-------------------|---------------|--------------------|--------------|--------------------|--------------|---------------------|----------------------------------------|------------------------------------------------------------|
|                            |                     | Gross income. | Electric service. |               |                    |              | All other sources. | Total.       | Salaries and wages. | Cost of supplies, materials, and fuel. | Rents, taxes, insurance, and other miscellaneous expenses. |
|                            |                     |               | Total.            | Lighting.     | Stationary motors. | All other.   |                    |              |                     |                                        |                                                            |
| United States.....         | 3,462               | \$161,630,339 | \$156,000,257     | \$112,714,851 | \$27,995,177       | \$15,290,229 | \$5,630,082        | \$97,037,961 | \$31,935,309        | \$39,490,881                           | \$25,611,771                                               |
| Alabama.....               | 27                  | 827,167       | 815,290           | 648,420       | 81,513             | 85,357       | 11,877             | 528,317      | 165,563             | 230,833                                | 131,921                                                    |
| Arizona.....               | 15                  | 589,850       | 544,192           | 446,962       | 71,808             | 25,422       | 25,658             | 414,347      | 130,663             | 231,221                                | 52,463                                                     |
| Arkansas.....              | 50                  | 553,247       | 543,086           | 500,051       | 17,856             | 25,179       | 10,161             | 356,807      | 126,464             | 177,869                                | 51,474                                                     |
| California.....            | 115                 | 14,125,542    | 13,637,803        | 7,881,923     | 3,773,587          | 1,982,293    | 487,739            | 8,188,387    | 3,030,781           | 2,966,408                              | 2,191,198                                                  |
| Colorado.....              | 49                  | 3,358,063     | 3,266,527         | 2,131,673     | 950,156            | 184,698      | 91,536             | 2,118,644    | 762,665             | 865,328                                | 560,651                                                    |
| Connecticut.....           | 36                  | 2,305,778     | 2,288,674         | 1,728,036     | 389,156            | 171,482      | 17,104             | 1,334,099    | 496,549             | 538,214                                | 299,336                                                    |
| Delaware.....              | 8                   | 1,422,478     | 1,400,512         | 1,144,224     | 191,584            | 64,704       | 21,966             | 841,098      | 249,883             | 335,329                                | 255,896                                                    |
| Florida.....               | 24                  | 274,022       | 260,290           | 248,828       | 5,342              | 6,120        | 13,732             | 214,647      | 78,131              | 109,560                                | 26,956                                                     |
| Georgia.....               | 34                  | 657,015       | 644,775           | 295,746       | 127,744            | 221,285      | 12,240             | 340,430      | 121,643             | 127,212                                | 91,575                                                     |
| Idaho.....                 | 40                  | 687,522       | 660,616           | 515,176       | 99,611             | 45,829       | 26,906             | 397,611      | 162,911             | 169,277                                | 65,423                                                     |
| Illinois.....              | 271                 | 13,960,932    | 13,068,516        | 8,787,325     | 2,439,673          | 1,841,518    | 892,416            | 7,185,497    | 2,586,872           | 2,806,088                              | 1,792,537                                                  |
| Indiana.....               | 132                 | 3,680,833     | 3,384,723         | 2,658,004     | 532,260            | 194,459      | 196,110            | 2,311,436    | 772,042             | 1,031,592                              | 507,802                                                    |
| Iowa.....                  | 141                 | 2,063,180     | 1,937,006         | 1,648,543     | 247,639            | 40,824       | 126,174            | 1,398,440    | 447,894             | 725,178                                | 225,368                                                    |
| Kansas.....                | 79                  | 1,282,639     | 1,199,163         | 880,519       | 216,868            | 101,776      | 83,476             | 873,851      | 306,631             | 399,966                                | 167,264                                                    |
| Kentucky.....              | 69                  | 1,480,713     | 1,432,688         | 1,207,769     | 206,072            | 15,847       | 48,025             | 905,091      | 261,964             | 443,644                                | 199,483                                                    |
| Louisiana.....             | 21                  | 1,609,836     | 1,587,491         | 1,344,652     | 228,576            | 16,263       | 22,345             | 1,006,710    | 328,955             | 375,274                                | 302,481                                                    |
| Maine.....                 | 77                  | 1,383,022     | 1,255,847         | 901,767       | 284,302            | 69,773       | 127,175            | 834,066      | 288,456             | 339,058                                | 216,552                                                    |
| Maryland.....              | 28                  | 1,790,939     | 1,766,137         | 1,412,184     | 344,939            | 9,014        | 24,902             | 1,444,125    | 468,894             | 507,409                                | 467,832                                                    |
| Massachusetts.....         | 96                  | 9,999,831     | 9,870,337         | 7,907,106     | 1,425,625          | 537,606      | 129,194            | 6,340,137    | 2,066,254           | 2,571,926                              | 1,701,957                                                  |
| Michigan.....              | 130                 | 4,838,924     | 4,574,513         | 2,708,581     | 842,845            | 1,029,087    | 264,411            | 2,964,020    | 807,680             | 1,557,492                              | 618,848                                                    |
| Minnesota.....             | 79                  | 2,708,790     | 2,614,904         | 2,015,020     | 508,196            | 93,688       | 91,886             | 1,707,166    | 575,364             | 792,642                                | 339,160                                                    |
| Mississippi.....           | 29                  | 357,818       | 348,844           | 313,791       | 20,744             | 14,306       | 8,974              | 223,256      | 80,656              | 99,226                                 | 43,372                                                     |
| Missouri.....              | 104                 | 5,301,950     | 5,189,372         | 3,642,998     | 970,985            | 575,389      | 112,578            | 3,411,378    | 1,190,072           | 1,294,154                              | 927,142                                                    |
| Montana.....               | 31                  | 2,439,922     | 2,347,563         | 1,121,493     | 963,608            | 262,461      | 92,359             | 1,084,484    | 353,928             | 413,661                                | 316,895                                                    |
| Nebraska.....              | 73                  | 1,344,080     | 1,259,928         | 1,025,414     | 160,902            | 73,613       | 84,151             | 846,697      | 268,552             | 406,790                                | 171,365                                                    |
| Nevada.....                | 9                   | 372,108       | 352,950           | 194,525       | 148,560            | 9,874        | 19,149             | 198,491      | 77,264              | 66,467                                 | 54,760                                                     |
| New Hampshire.....         | 52                  | 1,400,058     | 1,299,644         | 803,663       | 190,764            | 305,217      | 100,414            | 693,051      | 281,089             | 250,362                                | 161,600                                                    |
| New Jersey.....            | 57                  | 5,882,309     | 5,841,072         | 5,057,810     | 680,971            | 102,261      | 41,237             | 3,664,476    | 1,354,660           | 1,676,232                              | 633,584                                                    |
| New Mexico.....            | 15                  | 292,682       | 289,962           | 228,151       | 24,033             | 37,778       | 2,720              | 208,614      | 66,961              | 101,197                                | 40,436                                                     |
| New York.....              | 267                 | 34,410,708    | 33,628,543        | 23,869,100    | 5,677,498          | 4,081,945    | 782,165            | 19,228,083   | 5,692,784           | 6,879,997                              | 6,655,302                                                  |
| North Carolina.....        | 35                  | 229,882       | 219,875           | 129,842       | 64,797             | 25,235       | 10,007             | 158,884      | 58,959              | 70,290                                 | 27,635                                                     |
| North Dakota.....          | 21                  | 456,641       | 410,068           | 353,139       | 39,410             | 17,519       | 46,573             | 300,081      | 90,642              | 176,438                                | 23,001                                                     |
| Ohio.....                  | 167                 | 6,508,718     | 6,368,065         | 5,199,494     | 1,034,608          | 133,965      | 140,653            | 4,594,430    | 1,248,964           | 1,795,938                              | 1,549,528                                                  |
| Oklahoma.....              | 58                  | 1,019,945     | 1,012,333         | 837,175       | 103,140            | 72,018       | 7,612              | 727,276      | 237,658             | 327,510                                | 162,108                                                    |
| Oregon.....                | 50                  | 1,923,302     | 1,799,592         | 1,240,630     | 375,273            | 183,689      | 123,710            | 890,308      | 405,421             | 288,928                                | 195,959                                                    |
| Pennsylvania.....          | 282                 | 15,355,241    | 14,747,144        | 11,445,777    | 2,083,559          | 1,217,808    | 608,097            | 9,495,470    | 3,087,148           | 4,103,464                              | 2,304,858                                                  |
| Rhode Island.....          | 6                   | 1,710,432     | 1,613,068         | 1,243,419     | 302,493            | 67,156       | 97,364             | 982,260      | 347,947             | 407,480                                | 226,833                                                    |
| South Carolina.....        | 23                  | 754,011       | 733,041           | 281,430       | 428,599            | 23,012       | 20,970             | 394,361      | 109,305             | 121,651                                | 163,405                                                    |
| South Dakota.....          | 29                  | 439,767       | 420,785           | 308,761       | 109,871            | 2,153        | 18,982             | 301,907      | 108,603             | 166,530                                | 26,774                                                     |
| Tennessee.....             | 50                  | 1,012,443     | 991,782           | 808,961       | 111,032            | 71,789       | 20,661             | 567,354      | 180,251             | 248,663                                | 138,440                                                    |
| Texas.....                 | 209                 | 3,584,969     | 3,461,488         | 2,875,221     | 262,053            | 224,214      | 123,481            | 2,780,970    | 746,331             | 1,475,057                              | 559,562                                                    |
| Utah.....                  | 22                  | 608,107       | 570,306           | 199,145       | 166,920            | 204,241      | 37,801             | 320,837      | 140,159             | 113,586                                | 67,092                                                     |
| Vermont.....               | 47                  | 732,283       | 691,475           | 508,980       | 155,160            | 27,335       | 40,806             | 452,250      | 163,190             | 150,613                                | 138,447                                                    |
| Virginia.....              | 37                  | 253,055       | 246,161           | 200,265       | 26,396             | 19,500       | 6,894              | 161,857      | 70,393              | 62,114                                 | 29,350                                                     |
| Washington.....            | 65                  | 2,874,890     | 2,691,626         | 1,573,671     | 509,774            | 608,181      | 183,254            | 1,642,823    | 667,978             | 612,057                                | 362,788                                                    |
| West Virginia.....         | 43                  | 669,518       | 635,224           | 512,732       | 42,684             | 79,808       | 34,294             | 432,949      | 148,083             | 217,945                                | 66,921                                                     |
| Wisconsin.....             | 142                 | 1,899,907     | 1,773,563         | 1,434,932     | 248,231            | 90,400       | 126,344            | 1,357,715    | 444,231             | 650,064                                | 263,420                                                    |
| Wyoming.....               | 18                  | 317,580       | 303,683           | 291,822       | 11,761             | 100          | 13,897             | 215,773      | 77,811              | 102,955                                | 35,007                                                     |
| Alaska.....                | 9                   | 416,103       | 397,332           | 287,347       | 109,985            | .....        | 18,771             | 322,610      | 131,371             | 162,247                                | 29,192                                                     |
| Hawaii and Porto Rico..... | 6                   | 321,592       | 307,774           | 269,455       | 32,295             | 6,024        | 13,818             | 208,401      | 85,509              | 81,710                                 | 41,182                                                     |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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TABLE 131.—COMMERCIAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF INCOME, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                      | Number of stations. | INCOME.       |                   |                  |              |                    |                           |                                           |                   |                       |                    |             |
|------------------------------------------|---------------------|---------------|-------------------|------------------|--------------|--------------------|---------------------------|-------------------------------------------|-------------------|-----------------------|--------------------|-------------|
|                                          |                     | Gross income. | Electric service. |                  |              |                    |                           |                                           |                   |                       | All other sources. |             |
|                                          |                     |               | Total.            | Lighting.        |              | Stationary motors. | Electric-railway service. | Current sold to other electric companies. | Electric heating. | Charging automobiles. |                    | All other.  |
|                                          |                     |               |                   | Commer-<br>cial. | Public.      |                    |                           |                                           |                   |                       |                    |             |
| United States....                        | 3,462               | \$161,630,339 | \$156,000,257     | \$92,942,447     | \$19,772,404 | \$27,995,177       | \$7,829,275               | \$5,513,302                               | \$265,241         | \$153,459             | \$1,528,952        | \$5,630,082 |
| Alabama.....                             | 27                  | 827,167       | 815,290           | 558,597          | 89,823       | 81,513             | 60,583                    | .....                                     | 1,075             | .....                 | 23,699             | 11,877      |
| Arizona.....                             | 15                  | 569,850       | 544,192           | 415,860          | 31,102       | 71,808             | 17,818                    | 7,104                                     | .....             | .....                 | 500                | 25,658      |
| Arkansas.....                            | 50                  | 553,247       | 543,086           | 437,605          | 62,446       | 17,856             | 17,075                    | .....                                     | 18                | .....                 | 8,086              | 10,161      |
| California.....                          | 115                 | 14,125,542    | 13,637,803        | 7,064,389        | 817,534      | 3,773,587          | 1,396,735                 | 550,159                                   | 15,601            | 616                   | 19,182             | 487,739     |
| Colorado.....                            | 49                  | 3,358,063     | 3,266,527         | 1,879,278        | 252,395      | 950,156            | 29,071                    | 154,412                                   | 954               | 78                    | 183                | 91,536      |
| Connecticut.....                         | 36                  | 2,305,778     | 2,288,674         | 1,362,122        | 365,914      | 389,156            | 46,323                    | 122,973                                   | 626               | 1,204                 | 356                | 17,104      |
| Delaware <sup>1</sup> .....              | 8                   | 1,422,478     | 1,400,512         | 965,063          | 179,161      | 191,584            | 30,939                    | .....                                     | 3,627             | 26,500                | 3,638              | 21,966      |
| Florida.....                             | 24                  | 274,022       | 260,290           | 208,011          | 40,817       | 5,342              | 3,583                     | .....                                     | .....             | .....                 | 2,537              | 13,732      |
| Georgia.....                             | 34                  | 657,015       | 644,775           | 233,862          | 61,884       | 127,744            | 13,263                    | 204,654                                   | .....             | .....                 | 3,368              | 12,240      |
| Idaho.....                               | 40                  | 687,522       | 660,616           | 461,543          | 53,633       | 99,611             | 12,600                    | 32,504                                    | 725               | .....                 | .....              | 26,900      |
| Illinois.....                            | 271                 | 13,960,932    | 13,068,516        | 7,727,753        | 1,059,572    | 2,439,673          | 1,604,328                 | 147,435                                   | 77,307            | 8,547                 | 3,901              | 892,416     |
| Indiana.....                             | 132                 | 3,580,833     | 3,384,723         | 2,040,524        | 617,480      | 532,260            | 112,578                   | 41,703                                    | 34,005            | 1,393                 | 4,780              | 196,110     |
| Iowa.....                                | 141                 | 2,063,180     | 1,937,006         | 1,304,038        | 344,505      | 247,639            | 28,896                    | 577                                       | 5,131             | 2,626                 | 3,584              | 126,174     |
| Kansas.....                              | 79                  | 1,282,639     | 1,199,163         | 736,855          | 143,664      | 216,868            | 41,379                    | 44,753                                    | 3,237             | 921                   | 11,486             | 83,476      |
| Kentucky.....                            | 69                  | 1,480,713     | 1,432,688         | 868,578          | 339,191      | 206,072            | 16,627                    | .....                                     | 60                | 150                   | 2,010              | 48,025      |
| Louisiana.....                           | 21                  | 1,609,836     | 1,587,491         | 1,078,890        | 265,762      | 226,576            | 7,871                     | 421                                       | .....             | .....                 | 7,971              | 22,345      |
| Maine.....                               | 77                  | 1,383,022     | 1,255,847         | 731,822          | 169,945      | 284,302            | 29,454                    | 37,301                                    | 3,021             | 2                     | .....              | 127,175     |
| Maryland.....                            | 28                  | 1,790,939     | 1,766,137         | 1,164,953        | 247,231      | 344,939            | 7,114                     | 100                                       | .....             | .....                 | 1,800              | 24,802      |
| Massachusetts.....                       | 96                  | 9,999,531     | 9,870,337         | 5,942,486        | 1,964,620    | 1,425,625          | 288,638                   | 243,946                                   | 2,115             | 796                   | 2,111              | 129,194     |
| Michigan.....                            | 130                 | 4,838,924     | 4,574,513         | 2,372,164        | 336,417      | 842,845            | 277,115                   | 679,961                                   | 44,306            | 615                   | 21,090             | 264,411     |
| Minnesota.....                           | 79                  | 2,706,790     | 2,614,904         | 1,674,902        | 340,118      | 506,196            | 22,628                    | 41,629                                    | 6,801             | 3,298                 | 19,332             | 91,886      |
| Mississippi.....                         | 29                  | 357,818       | 348,844           | 263,281          | 50,510       | 20,744             | .....                     | 2,849                                     | 2,734             | .....                 | 8,726              | 8,974       |
| Missouri.....                            | 104                 | 5,301,950     | 5,189,372         | 3,290,339        | 352,659      | 970,985            | 471,694                   | 95,694                                    | .....             | 3,739                 | 4,262              | 112,578     |
| Montana.....                             | 31                  | 2,439,922     | 2,347,563         | 1,019,608        | 101,885      | 963,609            | 57,112                    | 188,529                                   | .....             | 30                    | 16,790             | 92,359      |
| Nebraska.....                            | 73                  | 1,344,080     | 1,259,929         | 887,429          | 137,985      | 160,902            | 18,067                    | 40,584                                    | 8,455             | 2,707                 | 3,800              | 84,151      |
| Nevada.....                              | 9                   | 372,108       | 352,959           | 184,736          | 9,789        | 148,560            | 8,340                     | .....                                     | 1,444             | 90                    | .....              | 19,149      |
| New Hampshire.....                       | 52                  | 1,400,058     | 1,299,644         | 584,595          | 219,068      | 190,764            | 217,361                   | 73,610                                    | 105               | 86                    | 14,055             | 100,414     |
| New Jersey.....                          | 57                  | 5,882,309     | 5,841,072         | 3,660,638        | 1,397,172    | 680,971            | 93,491                    | 4,166                                     | 2,575             | 1,173                 | 886                | 41,237      |
| New Mexico.....                          | 15                  | 292,682       | 289,962           | 208,587          | 19,564       | 24,033             | 5,924                     | 28,919                                    | 940               | 25                    | 1,970              | 2,720       |
| New York.....                            | 267                 | 34,410,708    | 33,628,543        | 20,204,998       | 3,664,102    | 5,677,498          | 1,168,700                 | 1,579,357                                 | 4,153             | 91,819                | 1,237,916          | 782,165     |
| North Carolina.....                      | 35                  | 229,882       | 219,875           | 95,230           | 34,613       | 64,797             | .....                     | 25,235                                    | .....             | .....                 | .....              | 10,007      |
| North Dakota.....                        | 21                  | 456,641       | 410,068           | 315,929          | 37,210       | 39,410             | 10,362                    | 4,000                                     | 200               | 37                    | 2,920              | 46,573      |
| Ohio.....                                | 167                 | 6,508,718     | 6,368,065         | 4,025,919        | 1,173,575    | 1,034,606          | 47,477                    | 48,476                                    | 2,350             | 290                   | 35,372             | 140,653     |
| Oklahoma.....                            | 58                  | 1,019,945     | 1,012,333         | 706,374          | 130,801      | 103,140            | 60,977                    | .....                                     | 4,000             | 1,000                 | 6,041              | 7,612       |
| Oregon.....                              | 50                  | 1,923,302     | 1,799,592         | 1,061,886        | 178,744      | 375,273            | 167,072                   | 12,446                                    | 2,384             | .....                 | 1,787              | 123,710     |
| Pennsylvania.....                        | 282                 | 15,355,241    | 14,747,144        | 8,588,268        | 2,857,509    | 2,083,559          | 901,564                   | 273,315                                   | 30,627            | 3,436                 | 8,866              | 608,097     |
| Rhode Island.....                        | 6                   | 1,710,432     | 1,613,068         | 828,189          | 415,230      | 302,493            | 62,982                    | 3,000                                     | 500               | 674                   | .....              | 97,364      |
| South Carolina.....                      | 23                  | 754,011       | 733,041           | 207,713          | 73,717       | 428,599            | .....                     | 22,557                                    | 260               | .....                 | 195                | 20,970      |
| South Dakota.....                        | 29                  | 439,767       | 420,785           | 263,132          | 45,629       | 109,871            | 1,100                     | .....                                     | .....             | .....                 | 1,053              | 18,982      |
| Tennessee.....                           | 50                  | 1,012,443     | 991,782           | 690,963          | 117,996      | 111,032            | 69,964                    | 555                                       | 300               | .....                 | 970                | 20,661      |
| Texas.....                               | 209                 | 3,584,969     | 3,461,488         | 2,633,728        | 241,493      | 362,053            | 187,276                   | .....                                     | 2,055             | 1,529                 | 33,354             | 123,481     |
| Utah.....                                | 22                  | 608,107       | 570,306           | 181,408          | 17,737       | 166,920            | .....                     | 203,407                                   | 834               | .....                 | .....              | 37,801      |
| Vermont.....                             | 47                  | 732,283       | 691,475           | 408,813          | 100,167      | 155,160            | 13,281                    | 8,620                                     | 162               | .....                 | 5,272              | 40,808      |
| Virginia.....                            | 37                  | 253,055       | 246,161           | 166,121          | 34,144       | 26,396             | 1,825                     | 16,980                                    | 15                | .....                 | 680                | 6,894       |
| Washington.....                          | 65                  | 2,874,880     | 2,691,626         | 1,446,819        | 126,852      | 509,774            | 143,183                   | 463,138                                   | 663               | 41                    | 1,156              | 183,254     |
| West Virginia.....                       | 43                  | 669,518       | 635,224           | 418,774          | 93,958       | 42,684             | 4,714                     | 72,434                                    | .....             | .....                 | 2,660              | 34,294      |
| Wisconsin.....                           | 142                 | 1,899,907     | 1,773,563         | 1,111,195        | 323,737      | 248,231            | 52,191                    | 35,799                                    | 1,776             | 37                    | 597                | 126,344     |
| Wyoming.....                             | 18                  | 317,580       | 303,683           | 258,480          | 33,342       | 11,761             | .....                     | .....                                     | 100               | .....                 | .....              | 13,997      |
| Alaska.....                              | 9                   | 416,103       | 397,332           | 276,514          | 10,833       | 109,985            | .....                     | .....                                     | .....             | .....                 | .....              | 18,771      |
| Hawaii and Porto Rico <sup>2</sup> ..... | 6                   | 321,592       | 307,774           | 219,319          | 50,136       | 32,295             | .....                     | 1,979                                     | 704               | 175                   | 3,106              | 13,618      |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 132.—COMMERCIAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF

| SUPPLIES AND MATERIALS.                     |                     |                 |              |          |           |          |           |               |           |                     |             |                                                    |                                                   |
|---------------------------------------------|---------------------|-----------------|--------------|----------|-----------|----------|-----------|---------------|-----------|---------------------|-------------|----------------------------------------------------|---------------------------------------------------|
| STATE OR TERRITORY.                         | Number of stations. | Aggregate cost. | Total cost.  | Meters.  |           | Motors.  |           | Transformers. |           | Incandescent lamps. |             | Nernst lamps, vacuum and vapor lamps, etc. (cost). | Lamp fittings, etc., except for arc lamps (cost). |
|                                             |                     |                 |              | Num-ber. | Cost.     | Num-ber. | Cost.     | Num-ber.      | Cost.     | Number.             | Cost.       |                                                    |                                                   |
| 1 United States.....                        | 3,462               | \$39,490,881    | \$19,665,919 | 28,024   | \$378,432 | 4,522    | \$270,661 | 5,468         | \$288,586 | 19,036,085          | \$2,973,508 | \$69,230                                           | \$676,339                                         |
| 2 Alabama.....                              | 27                  | 230,833         | 72,709       | 262      | 3,518     | 4        | 250       | 30            | 1,160     | 29,796              | 5,381       | .....                                              | 3,352                                             |
| 3 Arizona.....                              | 15                  | 231,221         | 52,989       | 52       | 882       | 10       | 2,809     | 29            | 1,950     | 29,966              | 5,165       | .....                                              | 4,386                                             |
| 4 Arkansas.....                             | 50                  | 177,869         | 46,717       | 132      | 1,622     | .....    | .....     | 65            | 2,778     | 16,269              | 2,957       | .....                                              | 1,783                                             |
| 5 California.....                           | 115                 | 2,966,408       | 1,884,052    | 2,234    | 43,264    | 302      | 48,049    | 458           | 25,498    | 740,765             | 125,091     | 62                                                 | 82,395                                            |
| 6 Colorado.....                             | 49                  | 805,328         | 324,559      | 497      | 5,935     | 13       | 1,025     | 62            | 4,046     | 255,714             | 43,691      | 328                                                | 20,219                                            |
| 7 Connecticut.....                          | 36                  | 538,214         | 238,619      | 137      | 2,467     | .....    | .....     | 33            | 2,889     | 288,615             | 51,416      | 819                                                | 1,834                                             |
| 8 Delaware <sup>1</sup> .....               | 8                   | 335,329         | 191,452      | 93       | 1,149     | .....    | .....     | 59            | 2,345     | 233,562             | 40,982      | 200                                                | 453                                               |
| 9 Florida.....                              | 24                  | 109,560         | 29,643       | 36       | 564       | 3        | 419       | 38            | 1,605     | 26,785              | 4,994       | 25                                                 | 5,226                                             |
| 10 Georgia.....                             | 34                  | 127,212         | 61,418       | 68       | 735       | 4        | 216       | 10            | 422       | 30,850              | 5,096       | .....                                              | 2,020                                             |
| 11 Idaho.....                               | 40                  | 169,277         | 133,630      | 231      | 3,930     | 24       | 800       | 61            | 5,664     | 41,315              | 9,413       | 175                                                | 5,779                                             |
| 12 Illinois.....                            | 271                 | 2,806,088       | 1,166,610    | 1,986    | 24,906    | 76       | 5,798     | 529           | 21,542    | 2,155,847           | 322,401     | 725                                                | 89,513                                            |
| 13 Indiana.....                             | 132                 | 1,031,592       | 392,107      | 3,031    | 35,262    | 61       | 7,645     | 354           | 28,886    | 362,600             | 60,786      | 492                                                | 15,317                                            |
| 14 Iowa.....                                | 141                 | 725,178         | 304,085      | 570      | 8,099     | 22       | 1,754     | 155           | 6,225     | 145,185             | 27,858      | 419                                                | 14,053                                            |
| 15 Kansas.....                              | 79                  | 399,956         | 148,596      | 284      | 5,120     | 82       | 5,318     | 34            | 1,461     | 131,285             | 22,289      | 557                                                | 12,886                                            |
| 16 Kentucky.....                            | 69                  | 443,644         | 177,394      | 133      | 1,736     | 32       | 2,844     | 73            | 2,774     | 126,407             | 19,743      | 93                                                 | 8,555                                             |
| 17 Louisiana.....                           | 21                  | 375,274         | 177,884      | 23       | 336       | .....    | .....     | 23            | 540       | 220,690             | 32,171      | 129                                                | 4,098                                             |
| 18 Maine.....                               | 77                  | 329,058         | 212,970      | 135      | 1,678     | 78       | 15,100    | 45            | 3,037     | 157,214             | 28,954      | 714                                                | 37,871                                            |
| 19 Maryland.....                            | 28                  | 507,409         | 214,124      | 92       | 1,653     | 6        | 750       | 99            | 2,840     | 406,652             | 78,945      | 1,436                                              | 3,051                                             |
| 20 Massachusetts.....                       | 96                  | 2,571,926       | 1,318,930    | 3,972    | 53,738    | 256      | 37,451    | 394           | 29,245    | 1,892,107           | 306,452     | 2,135                                              | 4,658                                             |
| 21 Michigan.....                            | 130                 | 1,537,492       | 963,057      | 419      | 4,529     | 48       | 4,049     | 134           | 4,488     | 665,775             | 125,266     | 4,377                                              | 18,428                                            |
| 22 Minnesota.....                           | 79                  | 792,642         | 489,237      | 514      | 6,605     | 3        | 229       | 87            | 5,066     | 373,762             | 62,249      | 326                                                | 30,295                                            |
| 23 Mississippi.....                         | 29                  | 99,228          | 22,389       | 44       | 579       | .....    | .....     | 23            | 931       | 23,715              | 4,051       | .....                                              | 1,268                                             |
| 24 Missouri.....                            | 104                 | 1,294,164       | 668,214      | 698      | 18,400    | 35       | 3,320     | 157           | 6,121     | 421,447             | 64,770      | 7,652                                              | 19,486                                            |
| 25 Montana.....                             | 31                  | 413,661         | 297,758      | 491      | 5,552     | 10       | 2,193     | 18            | 537       | 97,996              | 16,927      | 50                                                 | 1,366                                             |
| 26 Nebraska.....                            | 73                  | 406,780         | 153,037      | 264      | 3,596     | 22       | 1,387     | 14            | 1,215     | 215,318             | 36,320      | 1,552                                              | 15,415                                            |
| 27 Nevada.....                              | 9                   | 66,467          | 50,600       | 1        | 20        | 6        | 1,765     | 30            | 3,805     | 10,101              | 2,258       | .....                                              | 205                                               |
| 28 New Hampshire.....                       | 52                  | 250,362         | 108,559      | 474      | 6,682     | 19       | 2,349     | 86            | 3,481     | 69,150              | 13,253      | 234                                                | 4,525                                             |
| 29 New Jersey.....                          | 57                  | 1,676,232       | 687,084      | 4,560    | 47,656    | 72       | 1,217     | 375           | 18,282    | 1,019,660           | 164,659     | 405                                                | 2,976                                             |
| 30 New Mexico.....                          | 15                  | 101,197         | 48,399       | 6        | 84        | 3        | 375       | 2             | 275       | 7,402               | 1,252       | .....                                              | 2,110                                             |
| 31 New York.....                            | 267                 | 6,879,997       | 3,975,968    | 966      | 16,994    | 2,722    | 77,609    | 269           | 12,093    | 4,495,742           | 592,143     | 16,174                                             | 64,515                                            |
| 32 North Carolina.....                      | 35                  | 70,290          | 23,033       | 2        | 34        | .....    | .....     | 6             | 450       | 12,480              | 2,484       | 55                                                 | 2,924                                             |
| 33 North Dakota.....                        | 21                  | 176,438         | 23,399       | 80       | 1,158     | 6        | 275       | 6             | 303       | 13,959              | 2,423       | 62                                                 | 694                                               |
| 34 Ohio.....                                | 167                 | 1,795,938       | 748,677      | 749      | 11,129    | 4        | 305       | 255           | 9,466     | 707,661             | 102,768     | 877                                                | 20,647                                            |
| 35 Oklahoma.....                            | 58                  | 327,510         | 66,944       | 113      | 1,414     | .....    | .....     | 64            | 2,815     | 35,694              | 6,488       | 150                                                | 884                                               |
| 36 Oregon.....                              | 50                  | 288,928         | 124,903      | 212      | 3,461     | .....    | .....     | 42            | 3,093     | 122,398             | 18,209      | 3                                                  | 2,056                                             |
| 37 Pennsylvania.....                        | 282                 | 4,103,464       | 2,249,871    | 1,409    | 16,287    | 244      | 26,512    | 498           | 18,159    | 2,047,319           | 328,571     | 13,689                                             | 45,014                                            |
| 38 Rhode Island.....                        | 6                   | 407,480         | 163,915      | 232      | 3,393     | 7        | 1,137     | 69            | 7,951     | 229,293             | 39,339      | 120                                                | 4,221                                             |
| 39 South Carolina.....                      | 23                  | 121,651         | 68,491       | 145      | 1,843     | 7        | 600       | 59            | 2,131     | 45,358              | 8,124       | .....                                              | 5,970                                             |
| 40 South Dakota.....                        | 29                  | 166,530         | 44,921       | 610      | 6,414     | 22       | 1,545     | 20            | 4,499     | 37,532              | 6,053       | 6                                                  | 5,947                                             |
| 41 Tennessee.....                           | 50                  | 248,663         | 82,896       | 130      | 1,804     | 1        | 90        | 59            | 2,142     | 129,105             | 25,380      | .....                                              | 5,873                                             |
| 42 Texas.....                               | 209                 | 1,475,057       | 350,807      | 965      | 11,447    | 261      | 10,393    | 356           | 12,389    | 273,378             | 44,000      | 11,017                                             | 17,890                                            |
| 43 Utah.....                                | 22                  | 113,586         | 108,163      | 55       | 629       | 6        | 607       | 85            | 12,275    | 14,659              | 2,786       | .....                                              | 4,233                                             |
| 44 Vermont.....                             | 47                  | 150,613         | 102,603      | 119      | 2,367     | 15       | 1,882     | 55            | 3,421     | 99,297              | 15,882      | 1,050                                              | 19,928                                            |
| 45 Virginia.....                            | 37                  | 62,114          | 31,964       | 37       | 482       | .....    | .....     | 19            | 962       | 22,499              | 4,047       | 52                                                 | 1,862                                             |
| 46 Washington.....                          | 65                  | 612,057         | 454,172      | 207      | 2,933     | 1        | 70        | 45            | 4,399     | 235,024             | 34,386      | 1,096                                              | 30,666                                            |
| 47 West Virginia.....                       | 43                  | 217,945         | 115,013      | 15       | 235       | .....    | .....     | 23            | 1,114     | 58,567              | 10,584      | .....                                              | 1,858                                             |
| 48 Wisconsin.....                           | 142                 | 650,064         | 268,659      | 436      | 5,182     | 32       | 2,344     | 49            | 1,370     | 247,056             | 42,475      | 1,342                                              | 26,491                                            |
| 49 Wyoming.....                             | 18                  | 102,955         | 24,698       | 83       | 949       | 3        | 180       | 12            | 446       | 13,114              | 2,696       | 632                                                | 1,163                                             |
| 50 Alaska.....                              | 9                   | 162,247         | 47,251       | 20       | 260       | 3        | 514       | 24            | 1,262     | 20,063              | 6,040       | .....                                              | 3,203                                             |
| 51 Hawaii and Porto Rico <sup>1</sup> ..... | 6                   | 81,710          | 22,992       | 254      | 3,595     | .....    | .....     | .....         | .....     | 10,697              | 1,809       | .....                                              | 455                                               |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.



## GENERAL TABLES.

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## SUPPLIES, MATERIALS, AND FUEL, BY STATES AND TERRITORIES: 1907.

| SUPPLIES AND MATERIALS—continued.                                             |                                  |                        |                                                                                            |                  |                   |                                                               |                                             | COST OF FUEL. |              |                  |              |                   |                 |    |
|-------------------------------------------------------------------------------|----------------------------------|------------------------|--------------------------------------------------------------------------------------------|------------------|-------------------|---------------------------------------------------------------|---------------------------------------------|---------------|--------------|------------------|--------------|-------------------|-----------------|----|
| Carbons, globes, hoods, and other supplies for arc lamps, and repairs (cost). | Poles and other supports (cost). | Wire and cable (cost). | All other supplies and materials, including water for boilers, mill supplies, etc. (cost). | Power purchased. |                   | Rent of water privileges for water wheels or turbines (cost). | Freight, not included in cost of materials. | Total.        | Coal.        | Crude petroleum. | Natural gas. | Manufactured gas. | All other fuel. |    |
|                                                                               |                                  |                        |                                                                                            | Electric (cost). | All other (cost). |                                                               |                                             |               |              |                  |              |                   |                 |    |
| \$1,456,927                                                                   | \$701,081                        | \$1,623,078            | \$3,993,181                                                                                | \$6,080,905      | \$615,283         | \$351,443                                                     | \$187,265                                   | \$19,824,962  | \$16,780,874 | \$2,043,000      | \$250,181    | \$194,816         | \$547,091       | 1  |
| 8,047                                                                         | 3,961                            | 10,896                 | 33,867                                                                                     |                  |                   | 900                                                           | 1,377                                       | 158,124       | 151,427      |                  |              |                   | 6,697           | 2  |
| 3,068                                                                         | 2,044                            | 6,359                  | 16,678                                                                                     | 7,148            |                   | 2,500                                                         |                                             | 178,232       | 6,310        | 167,922          |              |                   | 4,000           | 3  |
| 1,797                                                                         | 2,797                            | 4,970                  | 18,260                                                                                     | 2,580            | 6,870             |                                                               | 303                                         | 131,152       | 119,251      |                  |              |                   | 11,901          | 4  |
| 77,164                                                                        | 111,428                          | 153,588                | 514,022                                                                                    | 651,530          | 4,783             | 46,158                                                        | 1,020                                       | 1,062,356     |              | 911,568          |              | 150,407           | 20,381          | 5  |
| 25,028                                                                        | 7,916                            | 27,522                 | 62,637                                                                                     | 109,634          |                   | 11,150                                                        | 5,428                                       | 480,769       | 478,349      |                  |              |                   | 2,420           | 6  |
| 22,671                                                                        | 15,485                           | 25,067                 | 54,187                                                                                     | 38,678           | 5,650             | 15,518                                                        | 1,938                                       | 299,595       | 295,498      |                  |              |                   | 4,097           | 7  |
| 13,574                                                                        | 14,658                           | 36,141                 | 10,494                                                                                     | 71,391           |                   |                                                               | 65                                          | 143,877       | 143,877      |                  |              |                   |                 | 8  |
| 1,622                                                                         | 1,002                            | 3,388                  | 6,652                                                                                      | 954              |                   |                                                               | 3,192                                       | 79,917        | 12,048       |                  |              |                   | 67,869          | 9  |
| 3,403                                                                         | 5,180                            | 8,302                  | 13,844                                                                                     | 17,664           |                   | 4,536                                                         |                                             | 65,794        | 42,344       |                  |              |                   | 23,450          | 10 |
| 3,680                                                                         | 3,709                            | 6,789                  | 15,148                                                                                     | 78,079           |                   | 89                                                            | 375                                         | 35,647        | 23,920       |                  |              |                   | 11,727          | 11 |
| 125,007                                                                       | 18,533                           | 157,327                | 153,824                                                                                    | 146,478          | 59,691            | 27,360                                                        | 13,505                                      | 1,639,478     | 1,637,373    | 1,500            |              |                   | 605             | 12 |
| 61,303                                                                        | 20,797                           | 69,070                 | 80,868                                                                                     | 1,440            | 3,125             | 2,690                                                         | 4,426                                       | 639,485       | 627,357      | 2,921            | 7,850        |                   | 1,357           | 13 |
| 17,369                                                                        | 8,410                            | 56,882                 | 108,653                                                                                    | 17,767           | 1,980             | 1,980                                                         | 10,563                                      | 421,093       | 418,984      | 336              |              |                   | 1,773           | 14 |
| 7,141                                                                         | 4,048                            | 8,276                  | 37,730                                                                                     | 31,538           | 9,219             | 300                                                           | 2,713                                       | 251,360       | 186,796      | 18,500           | 44,839       |                   | 1,225           | 15 |
| 19,151                                                                        | 3,003                            | 18,226                 | 64,360                                                                                     | 36,297           |                   |                                                               | 612                                         | 264,888       | 264,888      |                  |              |                   | 1,362           | 16 |
| 14,413                                                                        | 5,270                            | 18,062                 | 27,464                                                                                     | 70,427           | 3,716             | 1,258                                                         |                                             | 197,390       | 138,810      | 43,895           | 714          |                   | 13,971          | 17 |
| 12,224                                                                        | 4,231                            | 15,921                 | 29,148                                                                                     | 32,762           | 7,006             | 22,340                                                        | 1,984                                       | 116,088       | 108,732      | 555              |              |                   | 6,801           | 18 |
| 67,867                                                                        | 2,812                            | 7,493                  | 40,948                                                                                     | 6,035            |                   |                                                               | 244                                         | 293,255       | 289,751      |                  |              |                   | 3,534           | 19 |
| 70,579                                                                        | 56,678                           | 221,682                | 219,261                                                                                    | 243,546          | 12,727            | 59,153                                                        | 1,635                                       | 1,252,996     | 1,226,917    | 2,301            |              |                   | 23,778          | 20 |
| 30,755                                                                        | 8,408                            | 39,064                 | 71,733                                                                                     | 606,345          | 14,330            | 17,614                                                        | 13,731                                      | 574,435       | 556,846      |                  |              | 212               | 17,377          | 21 |
| 29,677                                                                        | 41,770                           | 22,046                 | 56,602                                                                                     | 170,606          | 24,126            | 36,043                                                        | 3,607                                       | 303,405       | 269,295      |                  |              | 12,691            | 21,419          | 22 |
| 2,439                                                                         | 582                              | 1,990                  | 7,264                                                                                      | 3,270            |                   |                                                               | 15                                          | 76,839        | 64,198       |                  |              |                   | 12,641          | 23 |
| 43,114                                                                        | 36,125                           | 27,546                 | 90,175                                                                                     | 336,239          | 1,620             |                                                               | 13,646                                      | 625,950       | 552,078      | 59,392           | 11,086       |                   | 3,394           | 24 |
| 11,121                                                                        | 1,063                            | 13,552                 | 33,375                                                                                     | 195,185          | 11,489            | 5,250                                                         | 158                                         | 115,903       | 105,113      |                  |              |                   | 10,790          | 25 |
| 8,385                                                                         | 2,200                            | 14,456                 | 50,409                                                                                     | 5,579            | 2,349             | 5,172                                                         | 5,002                                       | 253,743       | 247,492      |                  |              |                   | 6,251           | 26 |
| 173                                                                           | 8,327                            | 7,075                  | 10,972                                                                                     | 15,000           |                   | 1,000                                                         |                                             | 15,867        | 8,192        |                  |              |                   | 7,675           | 27 |
| 8,627                                                                         | 4,276                            | 10,187                 | 25,538                                                                                     | 12,613           | 4,992             | 9,580                                                         | 2,222                                       | 141,803       | 129,902      | 4,496            |              |                   | 7,405           | 28 |
| 95,900                                                                        | 40,921                           | 100,732                | 165,886                                                                                    | 24,417           | 15,546            | 2,285                                                         | 6,162                                       | 989,148       | 980,868      | 1,610            |              | 60                | 6,610           | 29 |
| 808                                                                           | 711                              | 1,378                  | 10,267                                                                                     | 28,919           | 2,220             |                                                               |                                             | 52,798        | 51,154       |                  |              |                   | 1,644           | 30 |
| 213,944                                                                       | 94,008                           | 185,260                | 597,282                                                                                    | 2,024,008        | 65,069            | 12,581                                                        | 3,688                                       | 2,904,029     | 2,886,567    |                  | 6,732        | 7,648             | 3,082           | 31 |
| 1,591                                                                         | 1,187                            | 1,958                  | 8,715                                                                                      | 2,330            | 950               | 250                                                           | 105                                         | 47,257        | 40,114       |                  |              |                   | 7,143           | 32 |
| 2,217                                                                         | 1,346                            | 4,021                  | 8,427                                                                                      |                  |                   |                                                               | 2,473                                       | 153,039       | 151,944      |                  |              |                   | 1,095           | 33 |
| 81,482                                                                        | 25,231                           | 92,074                 | 372,236                                                                                    | 12,446           | 6,360             | 1,295                                                         | 12,421                                      | 1,047,261     | 973,140      | 50               | 69,451       |                   | 4,620           | 34 |
| 9,279                                                                         | 2,446                            | 2,906                  | 22,353                                                                                     | 16,707           | 1,080             |                                                               | 422                                         | 260,566       | 232,190      |                  | 27,457       |                   | 919             | 35 |
| 8,573                                                                         | 8,940                            | 16,350                 | 44,064                                                                                     | 11,920           | 1,100             | 3,655                                                         | 3,479                                       | 164,025       | 6,060        | 82,780           |              |                   | 75,185          | 36 |
| 241,304                                                                       | 57,783                           | 97,783                 | 618,880                                                                                    | 708,143          | 22,603            | 22,514                                                        | 32,620                                      | 1,853,593     | 1,787,007    | 1,302            | 64,171       | 15                | 1,098           | 37 |
| 24,481                                                                        | 8,488                            | 16,073                 | 42,246                                                                                     | 16,122           |                   |                                                               | 344                                         | 239,065       | 239,065      | 4,500            |              |                   |                 | 38 |
| 3,953                                                                         | 5,454                            | 5,037                  | 15,359                                                                                     | 19,921           |                   |                                                               | 99                                          | 53,100        | 35,657       | 4,118            |              |                   | 13,385          | 39 |
| 1,856                                                                         | 3,126                            | 5,543                  | 6,578                                                                                      |                  |                   |                                                               | 3,354                                       | 121,009       | 113,622      |                  |              |                   | 7,987           | 40 |
| 14,166                                                                        | 4,336                            | 4,237                  | 20,405                                                                                     | 240              | 3,165             | 400                                                           | 658                                         | 165,767       | 164,141      |                  |              |                   | 1,626           | 41 |
| 21,553                                                                        | 17,193                           | 48,331                 | 94,276                                                                                     | 27,792           | 5,241             | 3,220                                                         | 26,065                                      | 1,124,250     | 378,867      | 704,130          |              |                   | 41,253          | 42 |
| 1,015                                                                         | 4,542                            | 6,101                  | 25,883                                                                                     | 48,916           |                   | 300                                                           | 876                                         | 5,423         | 5,413        |                  |              |                   | 10              | 43 |
| 4,672                                                                         | 4,028                            | 13,234                 | 12,589                                                                                     | 6,975            | 11,070            | 4,900                                                         | 605                                         | 46,010        | 45,999       |                  |              |                   | 2,011           | 44 |
| 1,144                                                                         | 616                              | 3,454                  | 7,588                                                                                      | 8,097            | 2,400             | 1,100                                                         | 160                                         | 30,150        | 28,760       |                  |              |                   | 1,390           | 45 |
| 13,706                                                                        | 12,541                           | 25,816                 | 34,158                                                                                     | 28,560           | 255,859           | 9,887                                                         | 95                                          | 157,885       | 84,568       | 31,124           |              |                   | 42,193          | 46 |
| 6,288                                                                         | 1,451                            | 2,459                  | 16,398                                                                                     | 69,266           |                   | 1,650                                                         | 3,682                                       | 102,932       | 76,051       |                  | 26,881       |                   |                 | 47 |
| 17,641                                                                        | 10,090                           | 28,025                 | 56,466                                                                                     | 28,507           | 32,110            | 14,595                                                        | 2,021                                       | 381,405       | 315,682      |                  |              | 23,783            | 41,940          | 48 |
| 1,875                                                                         | 1,340                            | 3,258                  | 10,766                                                                                     | 1,218            |                   |                                                               | 175                                         | 78,257        | 78,257       |                  |              |                   |                 | 49 |
| 506                                                                           | 1,395                            | 4,099                  | 10,863                                                                                     |                  |                   | 750                                                           | 18,359                                      | 114,996       | 13,000       | 14,770           |              |                   | 87,226          | 50 |
| 1,104                                                                         | 1,009                            | 883                    | 3,258                                                                                      |                  |                   | 579                                                           | 10,300                                      | 58,718        | 32,652       | 26,066           |              |                   |                 | 51 |

\*Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed

TABLE 133.—COMMERCIAL CENTRAL ELECTRIC STATIONS—NUMBER OF SALARIED EMPLOYEES AND TOTAL SALARIES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                      | Number of stations. | TOTAL.  |              | GENERAL OFFICERS OF CORPORATION. |             | GENERAL MANAGERS, SUPERINTENDENTS, ETC. |             | CLERKS AND BOOK-KEEPERS. |             |
|------------------------------------------|---------------------|---------|--------------|----------------------------------|-------------|-----------------------------------------|-------------|--------------------------|-------------|
|                                          |                     | Number. | Salaries.    | Number.                          | Salaries.   | Number.                                 | Salaries.   | Number.                  | Salaries.   |
| United States.....                       | 3,462               | 11,375  | \$10,738,955 | 1,761                            | \$2,202,028 | 3,268                                   | \$4,243,307 | 6,346                    | \$4,293,620 |
| Alabama.....                             | 27                  | 82      | 64,583       | 11                               | 13,119      | 28                                      | 28,600      | 43                       | 22,864      |
| Arizona.....                             | 15                  | 55      | 55,596       | 15                               | 13,311      | 21                                      | 29,854      | 22                       | 12,431      |
| Arkansas.....                            | 50                  | 60      | 41,070       | 7                                | 3,089       | 31                                      | 27,631      | 22                       | 10,350      |
| California.....                          | 115                 | 900     | 1,120,694    | 72                               | 144,098     | 209                                     | 389,166     | 619                      | 587,430     |
| Colorado.....                            | 49                  | 211     | 214,710      | 34                               | 50,162      | 68                                      | 91,332      | 109                      | 73,216      |
| Connecticut.....                         | 36                  | 160     | 157,749      | 54                               | 57,134      | 39                                      | 54,630      | 67                       | 45,985      |
| Delaware <sup>1</sup> .....              | 8                   | 84      | 79,315       | 11                               | 23,516      | 15                                      | 20,015      | 58                       | 35,784      |
| Florida.....                             | 24                  | 45      | 25,514       | 6                                | 2,410       | 22                                      | 15,839      | 17                       | 7,265       |
| Georgia.....                             | 34                  | 54      | 52,087       | 10                               | 10,690      | 26                                      | 31,238      | 18                       | 10,159      |
| Idaho.....                               | 40                  | 68      | 78,955       | 11                               | 20,955      | 27                                      | 38,174      | 30                       | 19,826      |
| Illinois.....                            | 271                 | 961     | 930,231      | 109                              | 133,774     | 239                                     | 338,393     | 613                      | 458,074     |
| Indiana.....                             | 132                 | 355     | 254,827      | 72                               | 65,686      | 119                                     | 108,107     | 164                      | 81,034      |
| Iowa.....                                | 141                 | 225     | 158,729      | 58                               | 39,741      | 82                                      | 79,057      | 85                       | 39,931      |
| Kansas.....                              | 79                  | 139     | 113,995      | 23                               | 19,905      | 64                                      | 65,928      | 52                       | 28,162      |
| Kentucky.....                            | 69                  | 108     | 89,391       | 14                               | 23,356      | 43                                      | 44,050      | 51                       | 21,985      |
| Louisiana.....                           | 21                  | 81      | 73,409       | 18                               | 24,652      | 18                                      | 19,117      | 45                       | 29,640      |
| Maine.....                               | 77                  | 151     | 95,679       | 37                               | 23,283      | 63                                      | 49,326      | 51                       | 23,070      |
| Maryland.....                            | 28                  | 154     | 154,855      | 27                               | 47,122      | 31                                      | 45,893      | 96                       | 61,840      |
| Massachusetts.....                       | 96                  | 595     | 649,248      | 122                              | 174,925     | 119                                     | 224,813     | 354                      | 249,510     |
| Michigan.....                            | 130                 | 378     | 290,514      | 47                               | 49,496      | 125                                     | 132,745     | 200                      | 98,273      |
| Minnesota.....                           | 79                  | 195     | 186,673      | 28                               | 37,613      | 73                                      | 93,942      | 94                       | 55,118      |
| Mississippi.....                         | 29                  | 47      | 36,335       | 9                                | 9,082       | 20                                      | 19,311      | 18                       | 7,942       |
| Missouri.....                            | 104                 | 423     | 410,215      | 45                               | 74,144      | 120                                     | 171,617     | 258                      | 164,454     |
| Montana.....                             | 31                  | 119     | 172,111      | 23                               | 38,385      | 39                                      | 75,619      | 57                       | 58,107      |
| Nebraska.....                            | 73                  | 96      | 90,696       | 18                               | 20,985      | 44                                      | 49,684      | 34                       | 20,027      |
| Nevada.....                              | 9                   | 23      | 27,071       | 1                                | 250         | 12                                      | 16,970      | 10                       | 9,851       |
| New Hampshire.....                       | 52                  | 104     | 80,918       | 38                               | 24,619      | 32                                      | 36,472      | 34                       | 19,827      |
| New Jersey.....                          | 57                  | 392     | 415,904      | 53                               | 111,866     | 81                                      | 115,749     | 238                      | 188,289     |
| New Mexico.....                          | 15                  | 27      | 21,505       | 6                                | 2,799       | 15                                      | 14,230      | 6                        | 4,476       |
| New York.....                            | 267                 | 1,821   | 1,745,757    | 191                              | 336,488     | 369                                     | 569,594     | 1,261                    | 839,675     |
| North Carolina.....                      | 35                  | 32      | 20,750       | 8                                | 3,520       | 15                                      | 14,170      | 9                        | 3,060       |
| North Dakota.....                        | 21                  | 39      | 32,898       | 8                                | 5,918       | 17                                      | 18,460      | 14                       | 8,520       |
| Ohio.....                                | 167                 | 454     | 442,096      | 85                               | 119,074     | 119                                     | 150,103     | 250                      | 172,919     |
| Oklahoma.....                            | 58                  | 107     | 83,217       | 16                               | 13,656      | 42                                      | 42,443      | 49                       | 27,118      |
| Oregon.....                              | 50                  | 112     | 127,797      | 7                                | 16,950      | 41                                      | 58,482      | 64                       | 52,365      |
| Pennsylvania.....                        | 252                 | 1,144   | 1,026,502    | 204                              | 195,516     | 315                                     | 414,610     | 625                      | 416,376     |
| Rhode Island.....                        | 6                   | 71      | 100,927      | 6                                | 25,601      | 16                                      | 33,595      | 49                       | 41,731      |
| South Carolina.....                      | 23                  | 72      | 52,958       | 18                               | 15,466      | 25                                      | 25,881      | 29                       | 11,611      |
| South Dakota.....                        | 29                  | 49      | 48,170       | 9                                | 12,305      | 28                                      | 27,343      | 12                       | 8,522       |
| Tennessee.....                           | 50                  | 86      | 71,775       | 11                               | 19,240      | 38                                      | 35,663      | 37                       | 16,872      |
| Texas.....                               | 209                 | 361     | 265,755      | 68                               | 61,184      | 124                                     | 118,402     | 160                      | 86,109      |
| Utah.....                                | 22                  | 52      | 48,183       | 5                                | 1,230       | 31                                      | 40,090      | 16                       | 6,863       |
| Vermont.....                             | 47                  | 89      | 59,945       | 19                               | 8,680       | 31                                      | 31,927      | 39                       | 19,338      |
| Virginia.....                            | 37                  | 51      | 31,072       | 11                               | 5,030       | 25                                      | 19,762      | 15                       | 6,280       |
| Washington.....                          | 65                  | 190     | 213,192      | 26                               | 45,245      | 68                                      | 89,067      | 96                       | 78,880      |
| West Virginia.....                       | 43                  | 79      | 48,065       | 24                               | 7,245       | 37                                      | 31,770      | 18                       | 9,050       |
| Wisconsin.....                           | 142                 | 236     | 158,595      | 55                               | 44,073      | 88                                      | 77,313      | 93                       | 37,209      |
| Wyoming.....                             | 18                  | 35      | 28,722       | 11                               | 5,440       | 14                                      | 17,140      | 10                       | 6,142       |
| Alaska.....                              | 9                   | 27      | 52,350       | 5                                | 10,680      | 16                                      | 32,500      | 6                        | 9,170       |
| Hawaii and Porto Rico <sup>2</sup> ..... | 6                   | 30      | 32,091       | 5                                | 521         | 12                                      | 20,001      | 13                       | 11,569      |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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TABLE 134.—COMMERCIAL CENTRAL ELECTRIC STATIONS—AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                      | Number of stations. | TOTAL.          |              | FOREMEN.        |             | INSPECTORS.     |           | ENGINEERS.      |             | ALL OTHER EMPLOYEES<br>(INCLUDING FIREMEN,<br>DYNAMO AND SWITCH-<br>BOARD MEN, LINEMEN,<br>MECHANICS, AND LAMP<br>TRIMMERS). |              |
|------------------------------------------|---------------------|-----------------|--------------|-----------------|-------------|-----------------|-----------|-----------------|-------------|------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                          |                     | Average number. | Wages.       | Average number. | Wages.      | Average number. | Wages.    | Average number. | Wages.      | Average number.                                                                                                              | Wages.       |
| United States.....                       | 3,462               | 30,691          | \$21,196,354 | 1,344           | \$1,446,048 | 860             | \$668,465 | 4,446           | \$3,484,231 | 24,041                                                                                                                       | \$15,597,610 |
| Alabama.....                             | 27                  | 167             | 100,980      | 9               | 6,970       | 4               | 2,989     | 35              | 23,715      | 119                                                                                                                          | 67,306       |
| Arizona.....                             | 15                  | 90              | 75,067       | 6               | 6,190       | 1               | 900       | 21              | 24,573      | 62                                                                                                                           | 43,404       |
| Arkansas.....                            | 50                  | 138             | 85,394       | 2               | 1,470       |                 |           | 40              | 29,209      | 96                                                                                                                           | 54,715       |
| California.....                          | 115                 | 2,143           | 1,910,087    | 114             | 154,213     | 37              | 39,580    | 120             | 132,953     | 1,872                                                                                                                        | 1,563,341    |
| Colorado.....                            | 49                  | 688             | 547,955      | 41              | 52,914      | 6               | 6,360     | 82              | 73,549      | 559                                                                                                                          | 415,132      |
| Connecticut.....                         | 36                  | 543             | 338,800      | 28              | 30,228      | 11              | 8,148     | 69              | 63,313      | 435                                                                                                                          | 237,111      |
| Delaware <sup>1</sup> .....              | 8                   | 243             | 170,568      | 7               | 7,368       | 9               | 6,690     | 23              | 20,266      | 204                                                                                                                          | 136,244      |
| Florida.....                             | 24                  | 90              | 52,617       | 3               | 2,582       |                 |           | 27              | 17,832      | 60                                                                                                                           | 32,203       |
| Georgia.....                             | 34                  | 115             | 69,556       | 7               | 7,760       |                 |           | 23              | 14,876      | 85                                                                                                                           | 46,920       |
| Idaho.....                               | 40                  | 110             | 83,956       | 11              | 10,530      | 3               | 1,500     | 21              | 15,446      | 75                                                                                                                           | 56,480       |
| Illinois.....                            | 271                 | 2,393           | 1,656,641    | 73              | 70,864      | 159             | 102,027   | 413             | 315,451     | 1,748                                                                                                                        | 1,168,299    |
| Indiana.....                             | 132                 | 931             | 517,215      | 29              | 23,584      | 17              | 13,088    | 190             | 128,988     | 695                                                                                                                          | 351,555      |
| Iowa.....                                | 141                 | 464             | 289,165      | 24              | 20,006      | 4               | 2,915     | 170             | 113,527     | 266                                                                                                                          | 152,717      |
| Kansas.....                              | 79                  | 296             | 192,636      | 11              | 10,144      | 6               | 4,296     | 102             | 73,437      | 177                                                                                                                          | 104,759      |
| Kentucky.....                            | 69                  | 413             | 172,573      | 12              | 9,505       | 2               | 1,200     | 90              | 59,737      | 309                                                                                                                          | 102,131      |
| Louisiana.....                           | 21                  | 363             | 255,546      | 7               | 8,400       | 10              | 9,240     | 33              | 30,063      | 313                                                                                                                          | 207,823      |
| Maine.....                               | 77                  | 322             | 192,777      | 16              | 14,261      | 6               | 3,857     | 42              | 27,805      | 258                                                                                                                          | 146,854      |
| Maryland.....                            | 28                  | 473             | 314,029      | 23              | 21,969      | 19              | 18,240    | 51              | 40,823      | 380                                                                                                                          | 232,997      |
| Massachusetts.....                       | 96                  | 1,853           | 1,417,006    | 77              | 81,432      | 68              | 57,509    | 204             | 201,867     | 1,504                                                                                                                        | 1,076,198    |
| Michigan.....                            | 130                 | 828             | 527,166      | 55              | 51,997      | 27              | 17,741    | 153             | 99,340      | 563                                                                                                                          | 358,068      |
| Minnesota.....                           | 79                  | 592             | 388,691      | 26              | 19,590      | 17              | 15,842    | 95              | 77,040      | 454                                                                                                                          | 276,219      |
| Mississippi.....                         | 29                  | 80              | 44,321       | 4               | 5,040       |                 |           | 27              | 18,740      | 49                                                                                                                           | 20,541       |
| Missouri.....                            | 104                 | 1,191           | 779,857      | 50              | 53,466      | 52              | 38,943    | 129             | 90,721      | 960                                                                                                                          | 566,727      |
| Montana.....                             | 31                  | 190             | 181,817      | 17              | 25,740      | 5               | 4,390     | 28              | 29,397      | 140                                                                                                                          | 122,290      |
| Nebraska.....                            | 73                  | 235             | 177,856      | 7               | 6,720       | 7               | 5,400     | 60              | 43,411      | 161                                                                                                                          | 122,325      |
| Nevada.....                              | 9                   | 55              | 50,193       | 5               | 6,750       |                 |           | 7               | 6,055       | 43                                                                                                                           | 37,388       |
| New Hampshire.....                       | 52                  | 308             | 200,171      | 13              | 12,186      | 2               | 1,560     | 31              | 28,327      | 262                                                                                                                          | 158,098      |
| New Jersey.....                          | 57                  | 1,338           | 938,756      | 29              | 27,537      | 32              | 20,853    | 146             | 134,366     | 1,131                                                                                                                        | 756,000      |
| New Mexico.....                          | 15                  | 56              | 45,476       | 3               | 3,480       |                 |           | 17              | 17,028      | 36                                                                                                                           | 24,968       |
| New York.....                            | 267                 | 5,679           | 3,947,027    | 248             | 302,620     | 160             | 132,552   | 383             | 340,363     | 4,888                                                                                                                        | 3,171,492    |
| North Carolina.....                      | 35                  | 85              | 38,209       | 2               | 1,500       |                 |           | 17              | 9,681       | 66                                                                                                                           | 27,028       |
| North Dakota.....                        | 21                  | 85              | 57,744       | 4               | 4,400       | 1               | 720       | 32              | 24,247      | 48                                                                                                                           | 28,377       |
| Ohio.....                                | 167                 | 1,160           | 806,868      | 47              | 47,385      | 51              | 40,555    | 264             | 198,559     | 798                                                                                                                          | 520,369      |
| Oklahoma.....                            | 58                  | 257             | 154,441      | 13              | 10,695      | 2               | 1,166     | 89              | 64,521      | 153                                                                                                                          | 78,059       |
| Oregon.....                              | 50                  | 334             | 277,624      | 26              | 27,510      | 7               | 6,487     | 47              | 44,343      | 254                                                                                                                          | 199,284      |
| Pennsylvania.....                        | 282                 | 3,146           | 2,060,646    | 129             | 139,747     | 89              | 69,908    | 445             | 347,178     | 2,483                                                                                                                        | 1,503,813    |
| Rhode Island.....                        | 6                   | 375             | 247,020      | 12              | 13,360      | 11              | 9,614     | 12              | 12,634      | 340                                                                                                                          | 211,412      |
| South Carolina.....                      | 23                  | 119             | 56,347       | 11              | 6,588       | 3               | 1,590     | 19              | 11,415      | 86                                                                                                                           | 36,754       |
| South Dakota.....                        | 29                  | 95              | 60,433       | 4               | 2,246       |                 |           | 33              | 21,651      | 58                                                                                                                           | 36,536       |
| Tennessee.....                           | 50                  | 211             | 108,476      | 6               | 4,900       | 7               | 5,750     | 50              | 31,825      | 148                                                                                                                          | 66,001       |
| Texas.....                               | 209                 | 852             | 480,576      | 34              | 29,740      | 7               | 4,327     | 261             | 167,298     | 550                                                                                                                          | 279,211      |
| Utah.....                                | 22                  | 119             | 91,976       | 3               | 2,460       | 1               | 960       | 13              | 9,609       | 102                                                                                                                          | 78,947       |
| Vermont.....                             | 47                  | 160             | 103,245      | 17              | 14,289      | 5               | 3,419     | 26              | 18,966      | 112                                                                                                                          | 66,571       |
| Virginia.....                            | 37                  | 78              | 39,321       | 3               | 1,715       |                 |           | 30              | 16,340      | 45                                                                                                                           | 21,266       |
| Washington.....                          | 65                  | 554             | 454,786      | 42              | 53,110      | 1               | 840       | 67              | 63,503      | 444                                                                                                                          | 337,333      |
| West Virginia.....                       | 43                  | 150             | 100,018      | 6               | 4,520       |                 |           | 57              | 43,268      | 87                                                                                                                           | 52,230       |
| Wisconsin.....                           | 142                 | 463             | 285,636      | 25              | 23,127      | 11              | 7,309     | 134             | 89,363      | 293                                                                                                                          | 165,837      |
| Wyoming.....                             | 18                  | 61              | 49,069       | 3               | 3,240       |                 |           | 18              | 17,592      | 40                                                                                                                           | 28,257       |
| Alaska.....                              | 9                   | 49              | 79,021       | 4               | 9,120       | 1               | 1,800     | 16              | 25,085      | 28                                                                                                                           | 43,016       |
| Hawaii and Porto Rico <sup>2</sup> ..... | 6                   | 80              | 53,418       | 3               | 3,600       | 4               | 3,380     | 6               | 8,770       | 67                                                                                                                           | 37,668       |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

TABLE 135.—COMMERCIAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF MISCELLANEOUS EXPENSES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                      | Number of stations. | Total expenses. | Rent of stations, line-wire supports, conduits, etc. | Rent of offices. | Taxes.      | Injuries and damages. | Insurance.  | Ordinary repairs of buildings and machinery. | All other expenses. |
|------------------------------------------|---------------------|-----------------|------------------------------------------------------|------------------|-------------|-----------------------|-------------|----------------------------------------------|---------------------|
| United States.....                       | 3,482               | \$25,611,771    | \$2,317,099                                          | \$566,472        | \$6,345,796 | \$602,523             | \$1,467,936 | \$3,986,586                                  | \$10,325,350        |
| Alabama.....                             | 27                  | 131,921         | 151                                                  | 8,705            | 34,704      | 1,648                 | 13,533      | 22,333                                       | 50,847              |
| Arizona.....                             | 15                  | 52,463          | 840                                                  | 3,185            | 13,749      | 1,623                 | 4,022       | 11,429                                       | 17,615              |
| Arkansas.....                            | 50                  | 51,474          | 2,060                                                | 1,504            | 7,045       | 3,050                 | 7,965       | 13,627                                       | 16,223              |
| California.....                          | 115                 | 2,191,198       | 2,890                                                | 58,477           | 491,455     | 26,399                | 82,157      | 468,241                                      | 1,061,579           |
| Colorado.....                            | 49                  | 550,651         | 5,797                                                | 25,361           | 120,656     | 10,363                | 38,106      | 81,149                                       | 289,219             |
| Connecticut.....                         | 36                  | 299,336         | 719                                                  | 6,523            | 44,177      | 5,528                 | 16,154      | 74,135                                       | 152,100             |
| Delaware.....                            | 8                   | 255,886         | .....                                                | 2,765            | 59,016      | 6,946                 | 7,870       | 63,459                                       | 115,830             |
| Florida.....                             | 24                  | 26,956          | .....                                                | 1,560            | 6,131       | 600                   | 3,430       | 5,696                                        | 9,639               |
| Georgia.....                             | 34                  | 91,575          | 4,000                                                | 4,379            | 19,038      | 172                   | 3,631       | 10,731                                       | 49,624              |
| Idaho.....                               | 40                  | 65,423          | 5,928                                                | 5,356            | 11,042      | 238                   | 2,790       | 4,939                                        | 35,130              |
| Illinois.....                            | 271                 | 1,792,537       | 47,525                                               | 56,946           | 545,268     | 85,043                | 129,969     | 330,857                                      | 596,929             |
| Indiana.....                             | 132                 | 507,802         | 1,427                                                | 19,753           | 111,488     | 11,484                | 35,769      | 164,134                                      | 163,747             |
| Iowa.....                                | 141                 | 225,368         | 909                                                  | 12,436           | 49,744      | 7,699                 | 23,620      | 43,505                                       | 87,455              |
| Kansas.....                              | 79                  | 167,264         | 817                                                  | 8,228            | 33,150      | 3,232                 | 13,761      | 30,181                                       | 77,896              |
| Kentucky.....                            | 69                  | 199,483         | 297                                                  | 3,998            | 81,962      | 5,994                 | 17,151      | 37,937                                       | 52,144              |
| Louisiana.....                           | 21                  | 302,481         | .....                                                | 4,266            | 105,919     | 11,720                | 11,687      | 20,488                                       | 148,401             |
| Maine.....                               | 77                  | 216,552         | 104                                                  | 4,314            | 46,673      | 8,318                 | 15,441      | 26,578                                       | 115,124             |
| Maryland.....                            | 28                  | 467,832         | 93,317                                               | 10,916           | 73,338      | 20,528                | 25,062      | 49,855                                       | 194,816             |
| Massachusetts.....                       | 96                  | 1,701,957       | 32,326                                               | 25,962           | 677,379     | 13,176                | 136,243     | 267,984                                      | 548,687             |
| Michigan.....                            | 130                 | 185,848         | 69,685                                               | 12,965           | 167,917     | 7,406                 | 26,259      | 110,975                                      | 223,642             |
| Minnesota.....                           | 79                  | 339,160         | 2,465                                                | 13,190           | 136,425     | 10,181                | 20,294      | 54,549                                       | 102,066             |
| Mississippi.....                         | 29                  | 43,372          | .....                                                | 1,110            | 8,941       | 3,813                 | 6,456       | 11,413                                       | 11,639              |
| Missouri.....                            | 104                 | 927,142         | 16,525                                               | 21,960           | 245,671     | 23,796                | 51,984      | 143,223                                      | 423,983             |
| Montana.....                             | 31                  | 316,896         | 1,354                                                | 10,667           | 78,076      | 7,109                 | 7,020       | 19,475                                       | 193,194             |
| Nebraska.....                            | 73                  | 171,365         | 240                                                  | 7,009            | 55,057      | 2,847                 | 14,577      | 37,966                                       | 53,639              |
| Nevada.....                              | 9                   | 54,760          | 12,620                                               | 4,130            | 11,558      | 56                    | 6,493       | 6,142                                        | 13,761              |
| New Hampshire.....                       | 52                  | 161,600         | 309                                                  | 5,898            | 39,117      | 2,505                 | 20,669      | 34,420                                       | 58,682              |
| New Jersey.....                          | 57                  | 633,584         | 4,951                                                | 21,002           | 207,360     | 20,934                | 46,458      | 110,714                                      | 222,165             |
| New Mexico.....                          | 15                  | 40,436          | .....                                                | 1,004            | 6,682       | 409                   | 2,356       | 6,700                                        | 23,225              |
| New York.....                            | 267                 | 6,655,302       | 1,212,541                                            | 75,616           | 1,579,845   | 179,944               | 317,854     | 797,964                                      | 2,491,538           |
| North Carolina.....                      | 35                  | 27,635          | 300                                                  | 874              | 5,565       | 80                    | 3,245       | 5,071                                        | 12,500              |
| North Dakota.....                        | 21                  | 33,001          | 492                                                  | 1,211            | 9,389       | 952                   | 2,643       | 9,445                                        | 8,899               |
| Ohio.....                                | 167                 | 1,549,528       | 617,660                                              | 21,289           | 276,431     | 34,233                | 34,359      | 172,737                                      | 392,819             |
| Oklahoma.....                            | 58                  | 162,108         | 1,470                                                | 6,257            | 15,893      | 1,978                 | 13,695      | 22,857                                       | 99,968              |
| Oregon.....                              | 50                  | 195,959         | 120                                                  | 6,305            | 62,864      | 1,007                 | 10,178      | 49,867                                       | 65,618              |
| Pennsylvania.....                        | 282                 | 2,304,858       | 142,327                                              | 37,892           | 421,169     | 29,078                | 142,790     | 312,045                                      | 1,219,557           |
| Rhode Island.....                        | 6                   | 226,833         | 154                                                  | 5,700            | 99,853      | 1,241                 | 27,621      | 14,825                                       | 77,439              |
| South Carolina.....                      | 23                  | 163,406         | 17,012                                               | 2,228            | 20,986      | 427                   | 4,915       | 20,350                                       | 97,487              |
| South Dakota.....                        | 29                  | 26,774          | .....                                                | 1,764            | 6,946       | 230                   | 3,250       | 4,806                                        | 9,776               |
| Tennessee.....                           | 50                  | 138,440         | 100                                                  | 3,513            | 29,536      | 1,943                 | 9,351       | 39,247                                       | 54,450              |
| Texas.....                               | 209                 | 559,582         | 700                                                  | 11,708           | 98,895      | 31,157                | 34,661      | 95,591                                       | 286,870             |
| Utah.....                                | 22                  | 67,092          | 3,000                                                | 3,222            | 22,780      | 2,100                 | 171         | 5,545                                        | 30,274              |
| Vermont.....                             | 47                  | 138,447         | 1,441                                                | 4,224            | 17,286      | 33                    | 10,685      | 31,738                                       | 73,040              |
| Virginia.....                            | 37                  | 29,350          | 137                                                  | 3,349            | 4,788       | 1,448                 | 3,687       | 2,806                                        | 13,133              |
| Washington.....                          | 65                  | 362,788         | 2,701                                                | 5,855            | 108,224     | 4,836                 | 19,373      | 64,290                                       | 157,509             |
| West Virginia.....                       | 43                  | 66,921          | 960                                                  | 2,253            | 11,614      | 4,400                 | 7,877       | 18,949                                       | 20,668              |
| Wisconsin.....                           | 142                 | 263,420         | 8,728                                                | 7,974            | 57,122      | 4,156                 | 27,631      | 44,806                                       | 113,003             |
| Wyoming.....                             | 18                  | 35,007          | .....                                                | 1,669            | 7,372       | 464                   | 3,023       | 10,718                                       | 11,761              |
| Alaska.....                              | 9                   | 29,192          | .....                                                | 480              | 3,583       | .....                 | 720         | 5,671                                        | 18,738              |
| Hawaii and Porto Rico <sup>1</sup> ..... | 6                   | 41,182          | 235                                                  | 3,300            | 11,433      | .....                 | 1,965       | 6,866                                        | 17,363              |

<sup>1</sup> Includes 1 station in District of Columbia, in order that the operations of individual stations may not be disclosed.<sup>2</sup> Includes 1 municipal station in Porto Rico, in order that the operations of individual stations may not be disclosed.

## GENERAL TABLES.

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TABLE 136.—MUNICIPAL CENTRAL ELECTRIC STATIONS—SUBSTATION EQUIPMENT, MOTORS, TRANSFORMERS, METERS, CUSTOMERS, AND OUTPUT OF STATIONS, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | SUBSTATION PLANTS.       |               |             |                                               | STATIONARY MOTORS. |              | TRANSFORMERS IN CIRCUITS FOR CUSTOMERS. |             | Number of meters on consumption circuits. | Number of customers furnished electric current. | OUTPUT OF STATIONS, KILOWATT HOURS. |                  |
|-------------------------------------|---------------------|--------------------------|---------------|-------------|-----------------------------------------------|--------------------|--------------|-----------------------------------------|-------------|-------------------------------------------|-------------------------------------------------|-------------------------------------|------------------|
|                                     |                     | Total kilowatt capacity. | Transformers. |             | Kilowatt capacity of miscellaneous apparatus. | Number.            | Horse-power. | Number.                                 | Kilo-watts. |                                           |                                                 | Total for year.                     | Average per day. |
|                                     |                     |                          | Number.       | Kilo-watts. |                                               |                    |              |                                         |             |                                           |                                                 |                                     |                  |
| United States.....                  | 1,252               | 11,721                   | 164           | 10,563      | 1,158                                         | 4,507              | 31,689       | 44,152                                  | 161,397     | 215,154                                   | 283,625                                         | 289,462,788                         | 810,820          |
| Alabama.....                        | 28                  |                          |               |             |                                               | 42                 | 238          | 649                                     | 1,946       | 2,180                                     | 4,085                                           | 2,937,878                           | 8,477            |
| Arkansas.....                       | 13                  |                          |               |             |                                               | 6                  | 10           | 370                                     | 1,008       | 954                                       | 2,760                                           | 2,278,499                           | 6,242            |
| California.....                     | 14                  | 373                      | 7             | 373         |                                               | 295                | 2,206        | 1,328                                   | 4,947       | 6,451                                     | 7,016                                           | 3,840,413                           | 10,982           |
| Colorado.....                       | 7                   |                          |               |             |                                               | 15                 | 133          | 251                                     | 770         | 1,003                                     | 1,392                                           | 508,268                             | 2,383            |
| Connecticut.....                    | 5                   |                          |               |             |                                               | 155                | 1,132        | 185                                     | 1,651       | 2,146                                     | 2,367                                           | 3,206,790                           | 8,786            |
| Delaware.....                       | 6                   |                          |               |             |                                               | 1                  | 4            | 64                                      | 240         | 389                                       | 1,071                                           | 1,174,935                           | 3,219            |
| Florida.....                        | 13                  |                          |               |             |                                               | 121                | 915          | 934                                     | 4,414       | 5,241                                     | 5,944                                           | 7,407,231                           | 20,499           |
| Georgia.....                        | 59                  | 184                      | 4             | 184         |                                               | 87                 | 477          | 1,994                                   | 4,877       | 6,893                                     | 9,853                                           | 8,158,309                           | 22,468           |
| Illinois.....                       | 112                 | 3,591                    | 70            | 3,591       |                                               | 67                 | 256          | 2,932                                   | 7,851       | 8,872                                     | 15,760                                          | 27,971,563                          | 76,989           |
| Indiana.....                        | 68                  |                          |               |             |                                               | 407                | 3,342        | 3,660                                   | 15,584      | 19,539                                    | 25,371                                          | 23,946,094                          | 67,346           |
| Iowa.....                           | 51                  |                          |               |             |                                               | 202                | 611          | 855                                     | 2,846       | 8,952                                     | 11,169                                          | 7,341,898                           | 20,254           |
| Kansas.....                         | 32                  |                          |               |             |                                               | 211                | 1,076        | 896                                     | 3,264       | 4,415                                     | 6,453                                           | 6,670,932                           | 19,112           |
| Kentucky.....                       | 14                  |                          |               |             |                                               | 76                 | 566          | 962                                     | 2,695       | 2,763                                     | 3,462                                           | 4,118,765                           | 11,287           |
| Louisiana.....                      | 21                  |                          |               |             |                                               | 17                 | 45           | 559                                     | 1,884       | 2,431                                     | 3,728                                           | 3,988,155                           | 10,998           |
| Maine.....                          | 4                   | 497                      | 10            | 497         |                                               | 8                  | 27           | 236                                     | 490         | 325                                       | 335                                             | 1,936,505                           | 5,357            |
| Maryland.....                       | 8                   |                          |               |             |                                               | 45                 | 412          | 162                                     | 759         | 432                                       | 706                                             | 2,309,720                           | 6,328            |
| Massachusetts.....                  | 24                  | 262                      | 9             | 262         |                                               | 507                | 4,388        | 2,182                                   | 10,581      | 9,221                                     | 8,986                                           | 13,042,167                          | 35,734           |
| Michigan.....                       | 104                 | 2,165                    | 15            | 1,032       | 1,133                                         | 328                | 2,009        | 4,048                                   | 15,614      | 24,019                                    | 27,404                                          | 29,455,269                          | 78,699           |
| Minnesota.....                      | 92                  |                          |               |             |                                               | 300                | 1,643        | 1,881                                   | 6,247       | 17,056                                    | 19,911                                          | 12,138,290                          | 34,228           |
| Mississippi.....                    | 39                  |                          |               |             |                                               | 27                 | 307          | 1,069                                   | 3,629       | 3,999                                     | 6,373                                           | 7,146,801                           | 19,906           |
| Missouri.....                       | 58                  |                          |               |             |                                               | 86                 | 1,515        | 1,857                                   | 6,032       | 6,331                                     | 10,804                                          | 11,489,766                          | 32,150           |
| Nebraska.....                       | 25                  |                          |               |             |                                               | 55                 | 196          | 549                                     | 2,674       | 4,437                                     | 5,249                                           | 3,689,363                           | 10,294           |
| New Hampshire.....                  | 4                   | 75                       | 1             | 75          |                                               | 20                 | 81           | 232                                     | 738         | 462                                       | 687                                             | 808,112                             | 2,209            |
| New Jersey.....                     | 7                   |                          |               |             |                                               | 26                 | 81           | 282                                     | 1,154       | 1,347                                     | 1,423                                           | 1,170,145                           | 3,294            |
| New York.....                       | 47                  | 300                      | 5             | 300         |                                               | 113                | 951          | 1,927                                   | 6,064       | 6,400                                     | 7,350                                           | 10,906,131                          | 30,374           |
| North Carolina.....                 | 36                  | 180                      | 4             | 180         |                                               | 81                 | 929          | 903                                     | 3,359       | 4,535                                     | 6,479                                           | 5,085,607                           | 15,017           |
| North Dakota.....                   | 8                   |                          |               |             |                                               | 15                 | 46           | 111                                     | 396         | 1,311                                     | 1,539                                           | 1,019,510                           | 2,795            |
| Ohio.....                           | 105                 | 90                       | 4             | 90          |                                               | 338                | 1,681        | 4,277                                   | 13,550      | 19,274                                    | 23,949                                          | 29,294,089                          | 82,725           |
| Oklahoma.....                       | 14                  |                          |               |             |                                               | 8                  | 25           | 294                                     | 958         | 918                                       | 2,060                                           | 1,923,343                           | 5,400            |
| Oregon.....                         | 11                  | 250                      | 1             | 250         |                                               | 2                  | 8            | 125                                     | 514         | 686                                       | 1,740                                           | 772,695                             | 2,356            |
| Pennsylvania.....                   | 45                  | 145                      | 2             | 120         | 25                                            | 108                | 790          | 1,453                                   | 5,288       | 5,332                                     | 8,036                                           | 13,887,298                          | 38,166           |
| South Carolina.....                 | 17                  | 246                      | 7             | 246         |                                               | 71                 | 451          | 859                                     | 1,754       | 2,167                                     | 2,651                                           | 2,041,839                           | 6,588            |
| South Dakota.....                   | 8                   | 140                      | 4             | 140         |                                               | 9                  | 39           | 99                                      | 580         | 1,601                                     | 1,653                                           | 1,030,324                           | 2,945            |
| Tennessee.....                      | 28                  | 75                       | 6             | 75          |                                               | 18                 | 280          | 756                                     | 2,180       | 1,832                                     | 4,879                                           | 7,354,947                           | 20,258           |
| Texas.....                          | 9                   |                          |               |             |                                               | 90                 | 566          | 800                                     | 2,062       | 1,926                                     | 2,764                                           | 4,613,600                           | 12,640           |
| Utah.....                           | 9                   | 300                      | 3             | 300         |                                               | 81                 | 540          | 278                                     | 1,402       | 596                                       | 3,920                                           | 3,848,250                           | 10,632           |
| Vermont.....                        | 13                  | 218                      | 3             | 218         |                                               | 66                 | 722          | 516                                     | 2,557       | 2,150                                     | 3,190                                           | 3,762,490                           | 10,309           |
| Virginia.....                       | 14                  |                          |               |             |                                               | 98                 | 864          | 464                                     | 1,716       | 974                                       | 2,314                                           | 2,406,541                           | 6,596            |
| Washington.....                     | 6                   | 2,400                    | 4             | 2,400       |                                               | 215                | 1,734        | 1,304                                   | 11,018      | 16,292                                    | 17,306                                          | 7,099,655                           | 19,453           |
| West Virginia.....                  | 5                   |                          |               |             |                                               | 2                  | 40           | 68                                      | 235         | 46                                        | 370                                             | 1,714,215                           | 4,741            |
| Wisconsin.....                      | 64                  | 230                      | 5             | 230         |                                               | 81                 | 378          | 1,468                                   | 5,124       | 8,006                                     | 10,069                                          | 4,958,091                           | 13,663           |
| All other states <sup>1</sup> ..... | 5                   |                          |               |             |                                               | 33                 | 57           | 283                                     | 725         | 950                                       | 1,077                                           | 1,006,305                           | 2,757            |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 137.—MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER

| STATE OR TERRITORY. |                                     | Number of stations. | PRIMARY POWER. |                |              |                      |              |                                      |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
|---------------------|-------------------------------------|---------------------|----------------|----------------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-----------------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-------|
|                     |                                     |                     | Aggregate.     | Steam engines. |              |                      |              |                                      |              |                                   |              | Steam turbines. |              |                      |              |                                      |              |                                   |              |       |
|                     |                                     |                     |                | Total.         |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              | Total.          |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              |       |
|                     |                                     |                     |                | Number.        | Horse-power. | Number.              | Horse-power. | Number.                              | Horse-power. | Number.                           | Horse-power. | Number.         | Horse-power. | Number.              | Horse-power. | Number.                              | Horse-power. | Number.                           | Horse-power. |       |
| 1                   | United States..                     | 1,252               | 2,017          | 321,351        | 1,685        | 264,033              | 1,648        | 236,893                              | 33           | 22,840                            | 4            | 4,300           | 29           | 19,385               | 16           | 4,485                                | 5            | 3,500                             | 6            | 6,100 |
| 2                   | Alabama.....                        | 28                  | 33             | 4,538          | 31           | 4,206                | 31           | 4,206                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 3                   | Arkansas.....                       | 13                  | 18             | 2,909          | 18           | 2,909                | 18           | 2,909                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 4                   | California.....                     | 14                  | 22             | 5,230          | 19           | 4,250                | 19           | 4,250                                |              |                                   |              |                 | 1            | 750                  |              |                                      | 1            | 750                               |              |       |
| 5                   | Colorado.....                       | 7                   | 9              | 970            | 9            | 970                  | 9            | 970                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 6                   | Connecticut.....                    | 5                   | 20             | 4,590          | 13           | 3,815                | 11           | 2,465                                | 2            | 1,350                             |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 7                   | Delaware.....                       | 6                   | 12             | 1,340          | 12           | 1,340                | 12           | 1,340                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 8                   | Florida.....                        | 13                  | 35             | 7,969          | 20           | 3,816                | 19           | 3,066                                | 1            | 750                               |              |                 | 9            | 3,990                | 6            | 990                                  |              |                                   | 3            | 3,000 |
| 9                   | Georgia.....                        | 59                  | 71             | 9,964          | 69           | 9,784                | 69           | 9,784                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 10                  | Illinois.....                       | 112                 | 183            | 30,847         | 168          | 30,527               | 154          | 19,027                               | 11           | 8,200                             | 3            | 3,300           |              |                      |              |                                      |              |                                   |              |       |
| 11                  | Indiana.....                        | 68                  | 112            | 20,446         | 94           | 17,455               | 92           | 16,205                               | 2            | 1,250                             |              |                 | 3            | 2,000                |              |                                      | 3            | 2,000                             |              |       |
| 12                  | Iowa.....                           | 51                  | 80             | 9,811          | 70           | 9,238                | 69           | 8,688                                | 1            | 550                               |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 13                  | Kansas.....                         | 32                  | 50             | 7,521          | 43           | 6,909                | 43           | 6,909                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 14                  | Kentucky.....                       | 14                  | 23             | 4,584          | 23           | 4,584                | 21           | 3,084                                | 1            | 500                               | 1            | 1,000           |              |                      |              |                                      |              |                                   |              |       |
| 15                  | Louisiana.....                      | 21                  | 35             | 4,287          | 35           | 4,287                | 35           | 4,287                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 16                  | Maine.....                          | 4                   | 9              | 2,245          | 1            | 500                  | 1            | 500                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 17                  | Maryland.....                       | 8                   | 21             | 2,455          | 13           | 2,310                | 13           | 2,310                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 18                  | Massachusetts.....                  | 24                  | 60             | 15,805         | 46           | 9,842                | 44           | 8,542                                | 2            | 1,300                             |              |                 | 3            | 4,400                |              |                                      |              |                                   | 2            | 2,100 |
| 19                  | Michigan.....                       | 104                 | 179            | 31,504         | 139          | 23,053               | 135          | 20,303                               | 4            | 2,750                             |              |                 | 3            | 3,875                | 2            | 875                                  |              |                                   |              |       |
| 20                  | Minnesota.....                      | 92                  | 140            | 17,325         | 122          | 15,165               | 122          | 15,165                               |              |                                   |              |                 | 1            | 300                  | 1            | 300                                  |              |                                   |              |       |
| 21                  | Mississippi.....                    | 39                  | 63             | 8,167          | 56           | 7,957                | 56           | 7,957                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 22                  | Missouri.....                       | 58                  | 77             | 12,046         | 72           | 11,795               | 70           | 10,395                               | 2            | 1,400                             |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 23                  | Nebraska.....                       | 25                  | 39             | 4,231          | 30           | 3,792                | 30           | 3,792                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 24                  | New Hampshire.....                  | 4                   | 7              | 915            | 3            | 310                  | 3            | 310                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 25                  | New Jersey.....                     | 7                   | 12             | 1,697          | 9            | 1,532                | 9            | 1,532                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 26                  | New York.....                       | 47                  | 77             | 12,739         | 59           | 9,208                | 59           | 9,208                                |              |                                   |              |                 | 2            | 1,250                | 1            | 500                                  | 1            | 750                               |              |       |
| 27                  | North Carolina.....                 | 36                  | 51             | 6,775          | 45           | 6,334                | 45           | 6,334                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 28                  | North Dakota.....                   | 8                   | 13             | 1,425          | 13           | 1,425                | 13           | 1,425                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 29                  | Ohio.....                           | 105                 | 188            | 29,427         | 168          | 25,478               | 166          | 24,438                               | 2            | 1,040                             |              |                 | 4            | 2,200                | 3            | 1,200                                |              |                                   | 1            | 1,000 |
| 30                  | Oklahoma.....                       | 14                  | 17             | 2,195          | 17           | 2,195                | 17           | 2,195                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 31                  | Oregon.....                         | 11                  | 10             | 604            | 5            | 347                  | 5            | 347                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 32                  | Pennsylvania.....                   | 45                  | 88             | 13,541         | 77           | 12,530               | 75           | 11,030                               | 2            | 1,500                             |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 33                  | South Carolina.....                 | 17                  | 21             | 2,605          | 21           | 2,605                | 21           | 2,605                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 34                  | South Dakota.....                   | 8                   | 15             | 1,768          | 10           | 1,510                | 10           | 1,510                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 35                  | Tennessee.....                      | 28                  | 49             | 6,820          | 44           | 6,580                | 42           | 5,080                                | 2            | 1,500                             |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 36                  | Texas.....                          | 9                   | 14             | 2,940          | 13           | 2,865                | 12           | 2,115                                | 1            | 750                               |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 37                  | Utah.....                           | 9                   | 11             | 2,720          | 2            | 210                  | 2            | 210                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 38                  | Vermont.....                        | 13                  | 22             | 4,948          | 3            | 490                  | 3            | 490                                  |              |                                   |              |                 | 1            | 450                  | 1            | 450                                  |              |                                   |              |       |
| 39                  | Virginia.....                       | 14                  | 18             | 3,859          | 9            | 1,406                | 9            | 1,406                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 40                  | Washington.....                     | 6                   | 7              | 5,409          | 2            | 365                  | 2            | 365                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 41                  | West Virginia.....                  | 5                   | 7              | 1,575          | 7            | 1,575                | 7            | 1,575                                |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |
| 42                  | Wisconsin.....                      | 64                  | 94             | 9,870          | 71           | 8,029                | 71           | 8,029                                |              |                                   |              |                 | 2            | 170                  | 2            | 170                                  |              |                                   |              |       |
| 43                  | All other states <sup>1</sup> ..... | 5                   | 5              | 735            | 4            | 535                  | 4            | 535                                  |              |                                   |              |                 |              |                      |              |                                      |              |                                   |              |       |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## 167

| PRIMARY POWER—continued. |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             | GENERATING AND OTHER MAIN-STATION EQUIPMENT. |             |            |             |                 |         |                               |        |    |
|--------------------------|--------------|---------------|--------------|----------------------|--------------|--------------------------------------|--------------|-----------------------------------|--------------|-----------------------------------|--------------|--------------|-------------|----------------------------------------------|-------------|------------|-------------|-----------------|---------|-------------------------------|--------|----|
| Steam turbines—Con.      |              | Water wheels. |              |                      |              |                                      |              |                                   |              |                                   |              | Gas engines. |             | Auxiliary engines.                           |             | Dynamos.   |             |                 |         |                               |        |    |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | Aggregate. |             |                 |         |                               |        |    |
|                          |              | Total.        |              | 500 H. P. and under. |              | Over 500 H. P. but under 1,000 H. P. |              | 1,000 H. P. but under 2,000 H. P. |              | 2,000 H. P. but under 5,000 H. P. |              |              |             |                                              |             | Total.     |             | Under 200 K. W. |         | 200 K. W. but under 500 K. W. |        |    |
| Num-ber.                 | Horse-power. | Num-ber.      | Horse-power. | Num-ber.             | Horse-power. | Num-ber.                             | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.                          | Horse-power. | Num-ber.     | Kilo-watts. | Num-ber.                                     | Kilo-watts. | Num-ber.   | Kilo-watts. |                 |         |                               |        |    |
| 2                        | 5,300        | 153           | 30,347       | 149                  | 23,947       | 1                                    | 800          | 1                                 | 1,200        | 2                                 | 4,400        | 78           | 6,082       | 72                                           | 1,504       | 2,395      | 209,016     | 2,208           | 151,013 | 172                           | 44,753 | 1  |
|                          |              | 2             | 332          | 2                    | 332          |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 36         | 3,252       | 33              | 2,612   | 3                             | 640    | 2  |
|                          |              | 1             | 200          | 1                    | 200          |                                      |              |                                   |              |                                   |              |              |             | 1                                            | 30          | 23         | 2,044       | 22              | 1,844   | 1                             | 200    | 3  |
|                          |              | 2             | 90           | 2                    | 90           |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 23         | 2,868       | 15              | 1,038   | 8                             | 1,830  | 4  |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              | 5            | 685         |                                              |             | 12         | 665         | 12              | 665     |                               |        | 5  |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 19         | 2,710       | 14              | 1,205   | 5                             | 1,505  | 6  |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 17         | 970         | 17              | 970     |                               |        | 7  |
|                          |              | 2             | 180          | 2                    | 180          |                                      |              |                                   |              |                                   |              | 1            | 40          | 5                                            | 123         | 33         | 3,688       | 30              | 3,008   | 3                             | 680    | 8  |
|                          |              | 6             | 531          | 6                    | 531          |                                      |              |                                   |              |                                   |              | 11           | 302         | 4                                            | 18          | 79         | 7,115       | 73              | 5,875   | 6                             | 1,240  | 9  |
|                          |              | 3             | 355          | 3                    | 355          |                                      |              |                                   |              |                                   |              | 4            | 340         | 5                                            | 120         | 264        | 18,931      | 258             | 15,781  | 3                             | 900    | 10 |
|                          |              | 1             | 200          | 1                    | 200          |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 148        | 15,352      | 126             | 8,944   | 21                            | 5,908  | 11 |
|                          |              | 8             | 1,745        | 8                    | 1,745        |                                      |              |                                   |              |                                   |              | 2            | 166         | 5                                            | 52          | 95         | 6,360       | 93              | 5,860   | 2                             | 500    | 12 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              | 5            | 377         | 1                                            | 35          | 56         | 4,914       | 51              | 3,784   | 5                             | 1,130  | 13 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 30         | 2,809       | 26              | 1,559   | 3                             | 750    | 14 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 42         | 2,905       | 40              | 2,405   | 2                             | 500    | 15 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 8          | 862         | 6               | 362     | 2                             | 500    | 16 |
| 1                        | 2,300        | 6             | 1,185        | 6                    | 1,185        |                                      |              |                                   |              |                                   |              | 2            | 85          | 6                                            | 110         | 20         | 1,312       | 19              | 982     | 1                             | 330    | 17 |
| 1                        | 3,000        | 29            | 4,229        | 28                   | 3,029        |                                      |              | 1                                 | 1,200        |                                   |              | 4            | 328         | 1                                            | 50          | 80         | 9,822       | 67              | 4,647   | 12                            | 3,675  | 18 |
|                          |              | 10            | 1,496        | 10                   | 1,496        |                                      |              |                                   |              |                                   |              | 3            | 299         | 5                                            | 78          | 205        | 19,652      | 190             | 13,356  | 14                            | 4,296  | 19 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              | 6            | 361         | 1                                            | 7           | 161        | 11,209      | 163             | 9,209   | 8                             | 2,000  | 20 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              |              |             |                                              |             | 59         | 5,264       | 54              | 4,199   | 5                             | 1,075  | 21 |
|                          |              |               |              |                      |              |                                      |              |                                   |              |                                   |              | 1            | 70          | 4                                            | 181         | 94         | 7,6         |                 |         |                               |        |    |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 137.—MUNICIPAL CENTRAL ELECTRIC STATIONS—PRIMARY POWER AND

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 |                                    |                 |                    |                 |                                     |                 |
|--------------------------------------------------------|---------------------------------------|-----------------|-----------------------------------------|-----------------|-----------------------------------------|-----------------|-----------------------------------|-----------------|--------------------|-----------------|-------------------------------------|-----------------|------------------------------------|-----------------|--------------------|-----------------|-------------------------------------|-----------------|
| Dynamos—Continued.                                     |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| STATE OR TERRITORY.                                    | Aggregate—Continued.                  |                 |                                         |                 |                                         |                 | Direct-current, constant-voltage. |                 |                    |                 |                                     |                 | Direct-current, constant-amperage. |                 |                    |                 |                                     |                 |
|                                                        | 500 K. W.<br>but under<br>1,000 K. W. |                 | 1,000 K. W.<br>but under<br>2,000 K. W. |                 | 2,000 K. W.<br>but under<br>5,000 K. W. |                 | Total.                            |                 | Under 200<br>K. W. |                 | 200 K. W.<br>but under<br>500 K. W. |                 | Total.                             |                 | Under 200<br>K. W. |                 | 200 K. W.<br>but under<br>500 K. W. |                 |
|                                                        | Num-<br>ber.                          | Kilo-<br>watts. | Num-<br>ber.                            | Kilo-<br>watts. | Num-<br>ber.                            | Kilo-<br>watts. | Num-<br>ber.                      | Kilo-<br>watts. | Num-<br>ber.       | Kilo-<br>watts. | Num-<br>ber.                        | Kilo-<br>watts. | Num-<br>ber.                       | Kilo-<br>watts. | Num-<br>ber.       | Kilo-<br>watts. | Num-<br>ber.                        | Kilo-<br>watts. |
| 1 United States.....                                   | 11                                    | 6,450           | 3                                       | 4,800           | 1                                       | 2,000           | 511                               | 26,754          | 506                | 25,554          | 5                                   | 1,200           | 439                                | 19,239          | 435                | 17,971          | 4                                   | 1,268           |
| 2 Alabama.....                                         |                                       |                 |                                         |                 |                                         |                 | 5                                 | 297             | 5                  | 297             |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 3 Arkansas.....                                        |                                       |                 |                                         |                 |                                         |                 | 5                                 | 186             | 5                  | 186             |                                     |                 | 4                                  | 268             | 4                  | 268             |                                     |                 |
| 4 California.....                                      |                                       |                 |                                         |                 |                                         |                 | 3                                 | 50              | 3                  | 50              |                                     |                 | 2                                  | 45              | 2                  | 45              |                                     |                 |
| 5 Colorado.....                                        |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 | 1                                  | 22              | 1                  | 22              |                                     |                 |
| 6 Connecticut.....                                     |                                       |                 |                                         |                 |                                         |                 | 7                                 | 725             | 7                  | 725             |                                     |                 | 1                                  | 60              | 1                  | 60              |                                     |                 |
| 7 Delaware.....                                        |                                       |                 |                                         |                 |                                         |                 | 10                                | 410             | 10                 | 410             |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 8 Florida.....                                         |                                       |                 |                                         |                 |                                         |                 | 6                                 | 600             | 5                  | 400             | 1                                   | 200             | 3                                  | 375             | 3                  | 375             |                                     |                 |
| 9 Georgia.....                                         |                                       |                 |                                         |                 |                                         |                 | 6                                 | 198             | 6                  | 198             |                                     |                 | 2                                  | 50              | 2                  | 50              |                                     |                 |
| 10 Illinois.....                                       | 3                                     | 2,200           |                                         |                 |                                         |                 | 42                                | 1,768           | 42                 | 1,768           |                                     |                 | 117                                | 6,407           | 117                | 6,407           |                                     |                 |
| 11 Indiana.....                                        | 1                                     | 500             |                                         |                 |                                         |                 | 21                                | 1,527           | 21                 | 1,527           |                                     |                 | 36                                 | 1,953           | 34                 | 1,185           | 2                                   | 768             |
| 12 Iowa.....                                           |                                       |                 |                                         |                 |                                         |                 | 45                                | 2,724           | 44                 | 2,424           | 1                                   | 300             | 5                                  | 179             | 5                  | 179             |                                     |                 |
| 13 Kansas.....                                         |                                       |                 |                                         |                 |                                         |                 | 13                                | 715             | 13                 | 715             |                                     |                 | 2                                  | 75              | 2                  | 75              |                                     |                 |
| 14 Kentucky.....                                       | 1                                     | 500             |                                         |                 |                                         |                 | 7                                 | 341             | 7                  | 341             |                                     |                 | 7                                  | 258             | 7                  | 258             |                                     |                 |
| 15 Louisiana.....                                      |                                       |                 |                                         |                 |                                         |                 | 17                                | 759             | 17                 | 759             |                                     |                 | 1                                  | 38              | 1                  | 38              |                                     |                 |
| 16 Maine.....                                          |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 | 4                                  | 112             | 4                  | 112             |                                     |                 |
| 17 Maryland.....                                       |                                       |                 |                                         |                 |                                         |                 | 6                                 | 272             | 6                  | 272             |                                     |                 | 9                                  | 270             | 9                  | 270             |                                     |                 |
| 18 Massachusetts.....                                  |                                       |                 | 1                                       | 1,500           |                                         |                 | 8                                 | 192             | 8                  | 192             |                                     |                 | 20                                 | 470             | 20                 | 470             |                                     |                 |
| 19 Michigan.....                                       |                                       |                 |                                         |                 | 1                                       | 2,000           | 23                                | 1,382           | 23                 | 1,382           |                                     |                 | 55                                 | 2,241           | 55                 | 2,241           |                                     |                 |
| 20 Minnesota.....                                      |                                       |                 |                                         |                 |                                         |                 | 91                                | 4,742           | 89                 | 4,242           | 2                                   | 500             | 9                                  | 248             | 9                  | 248             |                                     |                 |
| 21 Mississippi.....                                    |                                       |                 |                                         |                 |                                         |                 | 11                                | 485             | 11                 | 485             |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 22 Missouri.....                                       |                                       |                 |                                         |                 |                                         |                 | 21                                | 958             | 21                 | 958             |                                     |                 | 12                                 | 445             | 12                 | 445             |                                     |                 |
| 23 Nebraska.....                                       |                                       |                 |                                         |                 |                                         |                 | 17                                | 948             | 17                 | 948             |                                     |                 | 1                                  | 75              | 1                  | 75              |                                     |                 |
| 24 New Hampshire.....                                  |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 25 New Jersey.....                                     |                                       |                 |                                         |                 |                                         |                 | 1                                 | 42              | 1                  | 42              |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 26 New York.....                                       | 1                                     | 500             |                                         |                 |                                         |                 | 15                                | 617             | 15                 | 617             |                                     |                 | 12                                 | 869             | 10                 | 369             | 2                                   | 500             |
| 27 North Carolina.....                                 |                                       |                 |                                         |                 |                                         |                 | 9                                 | 509             | 9                  | 509             |                                     |                 | 5                                  | 161             | 5                  | 161             |                                     |                 |
| 28 North Dakota.....                                   |                                       |                 |                                         |                 |                                         |                 | 9                                 | 475             | 8                  | 275             | 1                                   | 200             | 2                                  | 130             | 2                  | 130             |                                     |                 |
| 29 Ohio.....                                           | 1                                     | 500             |                                         |                 |                                         |                 | 42                                | 2,533           | 42                 | 2,533           |                                     |                 | 47                                 | 1,571           | 47                 | 1,571           |                                     |                 |
| 30 Oklahoma.....                                       |                                       |                 |                                         |                 |                                         |                 | 3                                 | 150             | 3                  | 150             |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 31 Oregon.....                                         |                                       |                 |                                         |                 |                                         |                 | 5                                 | 121             | 5                  | 121             |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 32 Pennsylvania.....                                   | 2                                     | 1,000           |                                         |                 |                                         |                 | 12                                | 557             | 12                 | 557             |                                     |                 | 44                                 | 1,755           | 44                 | 1,755           |                                     |                 |
| 33 South Carolina.....                                 |                                       |                 |                                         |                 |                                         |                 | 3                                 | 41              | 3                  | 41              |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 34 South Dakota.....                                   |                                       |                 |                                         |                 |                                         |                 | 6                                 | 305             | 6                  | 305             |                                     |                 | 1                                  | 10              | 1                  | 10              |                                     |                 |
| 35 Tennessee.....                                      | 2                                     | 1,200           |                                         |                 |                                         |                 | 13                                | 686             | 13                 | 686             |                                     |                 | 1                                  | 39              | 1                  | 39              |                                     |                 |
| 36 Texas.....                                          |                                       |                 |                                         |                 |                                         |                 | 3                                 | 93              | 3                  | 93              |                                     |                 | 7                                  | 240             | 7                  | 240             |                                     |                 |
| 37 Utah.....                                           |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 38 Vermont.....                                        |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 | 3                                  | 60              | 3                  | 60              |                                     |                 |
| 39 Virginia.....                                       |                                       |                 |                                         |                 |                                         |                 | 3                                 | 108             | 3                  | 108             |                                     |                 | 7                                  | 209             | 7                  | 209             |                                     |                 |
| 40 Washington.....                                     |                                       |                 | 2                                       | 3,300           |                                         |                 |                                   |                 |                    |                 |                                     |                 |                                    |                 |                    |                 |                                     |                 |
| 41 West Virginia.....                                  |                                       |                 |                                         |                 |                                         |                 |                                   |                 |                    |                 |                                     |                 | 10                                 | 417             | 10                 | 417             |                                     |                 |
| 42 Wisconsin.....                                      |                                       |                 |                                         |                 |                                         |                 | 22                                | 1,163           | 22                 | 1,163           |                                     |                 | 8                                  | 143             | 8                  | 143             |                                     |                 |
| 43 All other states <sup>1</sup> .....                 |                                       |                 |                                         |                 |                                         |                 | 1                                 | 75              | 1                  | 75              |                                     |                 | 1                                  | 44              | 1                  | 44              |                                     |                 |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.



## GENERAL TABLES.

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## GENERATING EQUIPMENT, BY STATES AND TERRITORIES: 1907—Continued.

| GENERATING AND OTHER MAIN-STATION EQUIPMENT—continued. |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         |                                               |
|--------------------------------------------------------|-------------|-----------------|-------------|-------------------------------|-------------|---------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|---------------|-------------|-----------|-------------|-----------|-------------|-----------------------------------------|-----------------------------------------------|
| Dynamoes—Continued.                                    |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             | Transformers. |             | Boosters. |             | Rotaries. |             | Storage-battery cells in main stations. | Kilowatt capacity of miscellaneous apparatus. |
| Alternating single-phase and polyphase current.        |             |                 |             |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         |                                               |
| Total.                                                 |             | Under 200 K. W. |             | 200 K. W. but under 500 K. W. |             | 500 K. W. but under 1,000 K. W. |             | 1,000 K. W. but under 2,000 K. W. |             | 2,000 K. W. but under 5,000 K. W. |             |               |             |           |             |           |             |                                         |                                               |
| Num-ber.                                               | Kilo-watts. | Num-ber.        | Kilo-watts. | Num-ber.                      | Kilo-watts. | Num-ber.                        | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.                          | Kilo-watts. | Num-ber.      | Kilo-watts. | Num-ber.  | Kilo-watts. | Num-ber.  | Kilo-watts. |                                         |                                               |
| 1,445                                                  | 163,023     | 1,267           | 107,488     | 163                           | 42,285      | 11                              | 6,450       | 3                                 | 4,800       | 1                                 | 2,000       | 145           | 5,287       | 21        | 336         | 5         | 713         | 496                                     | 953                                           |
| 31                                                     | 2,955       | 28              | 2,315       | 3                             | 640         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 15                                            |
| 14                                                     | 1,590       | 13              | 1,390       | 1                             | 200         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 10                                            |
| 18                                                     | 2,773       | 10              | 943         | 8                             | 1,830       |                                 |             |                                   |             |                                   |             | 5             | 221         |           |             |           |             |                                         | 4                                             |
| 11                                                     | 643         | 11              | 643         |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 5                                             |
| 11                                                     | 1,925       | 6               | 420         | 5                             | 1,505       |                                 |             |                                   |             |                                   |             |               |             |           | 1           | 100       |             |                                         | 60                                            |
| 7                                                      | 560         | 7               | 560         |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 7                                             |
| 24                                                     | 2,713       | 22              | 2,233       | 2                             | 480         |                                 |             |                                   |             |                                   |             | 17            | 243         |           |             | 1         | 275         |                                         | 12                                            |
| 71                                                     | 6,867       | 65              | 5,627       | 6                             | 1,240       |                                 |             |                                   |             |                                   |             |               |             | 1         | 22          |           |             |                                         | 8                                             |
| 105                                                    | 10,756      | 99              | 7,606       | 3                             | 900         | 3                               | 2,250       |                                   |             |                                   |             | 7             | 489         | 2         | 9           |           |             |                                         | 25                                            |
| 91                                                     | 11,872      | 71              | 6,232       | 19                            | 5,140       | 1                               | 500         |                                   |             |                                   |             | 23            | 2,119       |           |             | 2         | 138         |                                         | 10                                            |
| 45                                                     | 3,457       | 44              | 3,257       | 1                             | 200         |                                 |             |                                   |             |                                   |             |               |             | 1         | 13          |           |             | 140                                     | 35                                            |
| 41                                                     | 4,124       | 36              | 2,994       | 5                             | 1,130       |                                 |             |                                   |             |                                   |             | 3             | 71          |           |             |           |             |                                         | 14                                            |
| 16                                                     | 2,210       | 12              | 960         | 3                             | 750         | 1                               | 500         |                                   |             |                                   |             |               |             | 1         | 3           |           |             |                                         | 13                                            |
| 24                                                     | 2,108       | 22              | 1,608       | 2                             | 500         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             | 36                                      | 15                                            |
| 4                                                      | 750         | 2               | 250         | 2                             | 500         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 16                                            |
| 5                                                      | 770         | 4               | 440         | 1                             | 330         |                                 |             |                                   |             |                                   |             |               |             | 2         | 24          |           |             | 60                                      | 17                                            |
| 52                                                     | 9,160       | 39              | 3,985       | 12                            | 3,675       |                                 |             | 1                                 | 1,500       |                                   |             |               |             |           |             |           |             |                                         | 18                                            |
| 127                                                    | 16,029      | 112             | 9,733       | 14                            | 4,296       |                                 |             |                                   |             | 1                                 | 2,000       | 12            | 287         | 6         | 145         |           |             |                                         | 19                                            |
| 61                                                     | 6,219       | 55              | 4,719       | 6                             | 1,500       |                                 |             |                                   |             |                                   |             | 3             | 76          | 3         | 36          |           |             |                                         | 438                                           |
| 48                                                     | 4,779       | 43              | 3,704       | 5                             | 1,075       |                                 |             |                                   |             |                                   |             | 1             | 20          |           |             |           |             | 128                                     | 50                                            |
| 61                                                     | 6,224       | 57              | 4,849       | 4                             | 1,375       |                                 |             |                                   |             |                                   |             | 8             | 287         |           |             | 1         | 200         |                                         | 20                                            |
| 22                                                     | 1,988       | 20              | 1,588       | 2                             | 400         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 96                                            |
| 5                                                      | 545         | 5               | 545         |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 22                                            |
| 11                                                     | 1,175       | 10              | 925         | 1                             | 250         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 23                                            |
| 66                                                     | 6,881       | 60              | 5,281       | 5                             | 1,100       | 1                               | 500         |                                   |             |                                   |             | 9             | 214         |           |             |           |             |                                         | 24                                            |
| 44                                                     | 4,179       | 42              | 3,779       | 2                             | 400         |                                 |             |                                   |             |                                   |             | 4             | 93          | 1         | 30          |           |             |                                         | 25                                            |
| 4                                                      | 405         | 4               | 405         |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 26                                            |
| 146                                                    | 16,551      | 124             | 10,491      | 21                            | 5,560       | 1                               | 500         |                                   |             |                                   |             | 20            | 471         | 4         | 50          |           |             |                                         | 27                                            |
| 14                                                     | 1,235       | 13              | 1,035       | 1                             | 200         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 14                                            |
| 6                                                      | 370         | 6               | 370         |                               |             |                                 |             |                                   |             |                                   |             | 1             | 17          |           |             |           |             |                                         | 28                                            |
| 62                                                     | 6,549       | 56              | 4,697       | 4                             | 852         | 2                               | 1,000       |                                   |             |                                   |             | 4             | 12          |           |             |           |             |                                         | 165                                           |
| 20                                                     | 1,935       | 19              | 1,685       | 1                             | 250         |                                 |             |                                   |             |                                   |             | 13            | 270         |           |             |           |             |                                         | 29                                            |
| 8                                                      | 705         | 8               | 705         |                               |             |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             | 132                                     | 30                                            |
| 35                                                     | 4,416       | 29              | 2,166       | 4                             | 1,050       | 2                               | 1,200       |                                   |             |                                   |             | 2             | 35          |           |             |           |             |                                         | 31                                            |
| 11                                                     | 2,000       | 4               | 300         | 7                             | 1,700       |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 32                                            |
| 10                                                     | 1,460       | 7               | 610         | 3                             | 850         |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 33                                            |
| 19                                                     | 2,737       | 13              | 1,255       | 6                             | 1,482       |                                 |             |                                   |             |                                   |             |               |             |           |             |           |             |                                         | 34                                            |
| 13                                                     | 1,815       | 10              | 1,115       | 3                             | 700         |                                 |             |                                   |             |                                   |             | 6             | 240         |           |             |           |             |                                         | 35                                            |
| 6                                                      | 3,810       | 4               | 510         |                               |             |                                 |             | 2                                 | 3,300       |                                   |             | 1             | 2           |           |             |           |             |                                         | 36                                            |
| 4                                                      | 300         | 4               | 300         |                               |             |                                 |             |                                   |             |                                   |             | 1             | 2           |           |             |           |             |                                         | 37                                            |
| 65                                                     | 4,943       | 64              | 4,718       | 1                             | 225         |                                 |             |                                   |             |                                   |             | 3             | 103         | 1         | 4           |           |             |                                         | 38                                            |
| 7                                                      | 540         | 7               | 540         |                               |             |                                 |             |                                   |             |                                   |             | 2             | 15          |           |             |           |             |                                         | 39                                            |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 138.—MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS

| ARC LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |                                     |                     |            |             |           |         |           |                 |           |         |           |                      |           |         |           |
|-------------------------------------------------|-------------------------------------|---------------------|------------|-------------|-----------|---------|-----------|-----------------|-----------|---------|-----------|----------------------|-----------|---------|-----------|
| STATE OR TERRITORY.                             |                                     | Number of stations. | Aggregate. | Total.      |           |         |           | Direct-current. |           |         |           | Alternating-current. |           |         |           |
|                                                 |                                     |                     |            | Commercial. |           | Public. |           | Commercial.     |           | Public. |           | Commercial.          |           | Public. |           |
|                                                 |                                     |                     |            | Open.       | Inclosed. | Open.   | Inclosed. | Open.           | Inclosed. | Open.   | Inclosed. | Open.                | Inclosed. | Open.   | Inclosed. |
|                                                 |                                     |                     |            |             |           |         |           |                 |           |         |           |                      |           |         |           |
| 1                                               | United States.....                  | 1,252               | 82,940     | 426         | 9,432     | 18,004  | 55,078    | 354             | 1,101     | 17,209  | 14,434    | 72                   | 8,331     | 795     | 40,644    |
| 2                                               | Alabama.....                        | 28                  | 726        | 3           | 54        | 44      | 625       |                 | 5         |         | 34        | 3                    | 49        | 44      | 591       |
| 3                                               | Arkansas.....                       | 13                  | 609        | 3           | 32        | 9       | 565       | 3               | 1         | 9       | 336       |                      | 31        |         | 229       |
| 4                                               | California.....                     | 14                  | 865        | 20          | 40        | 96      | 709       |                 | 2         | 18      | 76        | 20                   | 38        | 78      | 633       |
| 5                                               | Colorado.....                       | 7                   | 125        |             | 51        | 15      | 59        |                 |           | 15      |           |                      | 51        |         | 59        |
| 6                                               | Connecticut.....                    | 5                   | 711        |             | 279       |         | 432       |                 | 83        |         | 115       |                      | 196       |         | 317       |
| 7                                               | Delaware.....                       | 6                   | 56         |             | 2         | 2       | 52        |                 |           | 2       |           |                      | 2         |         | 52        |
| 8                                               | Florida.....                        | 13                  | 1,020      | 144         | 50        | 177     | 649       | 144             |           | 177     | 6         |                      | 50        |         | 643       |
| 9                                               | Georgia.....                        | 59                  | 2,013      |             | 122       | 138     | 1,753     |                 | 3         | 80      | 26        |                      | 119       | 58      | 1,727     |
| 10                                              | Illinois.....                       | 112                 | 16,277     | 5           | 153       | 7,460   | 8,659     | 5               | 21        | 7,350   | 3,023     |                      | 132       | 110     | 5,636     |
| 11                                              | Indiana.....                        | 68                  | 5,498      | 40          | 1,362     | 1,260   | 2,836     | 40              | 76        | 1,240   | 770       |                      | 1,286     | 20      | 2,066     |
| 12                                              | Iowa.....                           | 51                  | 1,011      | 3           | 263       | 40      | 705       | 3               | 163       | 10      | 563       |                      | 100       | 30      | 142       |
| 13                                              | Kansas.....                         | 32                  | 1,505      | 1           | 203       | 223     | 1,078     |                 | 6         | 223     | 190       | 1                    | 197       |         | 888       |
| 14                                              | Kentucky.....                       | 14                  | 1,306      |             | 201       | 282     | 823       |                 |           | 282     | 262       |                      | 201       |         | 561       |
| 15                                              | Louisiana.....                      | 21                  | 608        |             | 72        |         | 536       |                 | 3         |         | 140       |                      | 69        |         | 396       |
| 16                                              | Maine.....                          | 4                   | 622        |             | 5         | 212     | 405       |                 |           | 212     |           |                      | 5         |         | 405       |
| 17                                              | Maryland.....                       | 8                   | 715        |             | 163       | 74      | 478       |                 |           | 74      | 314       |                      | 163       |         | 164       |
| 18                                              | Massachusetts.....                  | 24                  | 2,955      |             | 853       | 412     | 1,690     |                 | 34        | 412     | 271       |                      | 819       |         | 1,419     |
| 19                                              | Michigan.....                       | 104                 | 10,541     | 112         | 1,385     | 1,993   | 7,051     | 91              | 141       | 1,792   | 1,571     | 21                   | 1,244     | 201     | 5,480     |
| 20                                              | Minnesota.....                      | 92                  | 2,396      | 2           | 693       | 226     | 1,465     | 2               | 297       | 218     | 685       |                      | 396       | 8       | 780       |
| 21                                              | Mississippi.....                    | 39                  | 837        |             | 55        |         | 782       |                 | 1         |         | 55        |                      | 54        |         | 727       |
| 22                                              | Missouri.....                       | 58                  | 2,349      |             | 302       | 712     | 1,335     |                 | 20        | 668     | 299       |                      | 282       | 44      | 1,036     |
| 23                                              | Nebraska.....                       | 25                  | 942        | 8           | 163       | 99      | 672       | 8               | 2         | 99      | 125       |                      | 161       |         | 547       |
| 24                                              | New Hampshire.....                  | 4                   | 9          |             | 9         |         |           |                 |           |         |           |                      | 9         |         |           |
| 25                                              | New Jersey.....                     | 7                   | 175        |             | 8         | 2       | 165       |                 |           |         |           |                      | 8         | 2       | 165       |
| 26                                              | New York.....                       | 47                  | 3,289      | 2           | 234       | 498     | 2,555     |                 |           | 403     | 800       | 2                    | 234       | 95      | 1,755     |
| 27                                              | North Carolina.....                 | 36                  | 1,519      |             | 168       | 54      | 1,297     |                 | 12        | 54      | 292       |                      | 156       |         | 1,005     |
| 28                                              | North Dakota.....                   | 8                   | 256        |             | 39        | 16      | 201       |                 | 25        | 16      | 162       |                      | 14        |         | 39        |
| 29                                              | Ohio.....                           | 105                 | 9,517      | 53          | 675       | 1,389   | 7,400     | 50              | 65        | 1,317   | 1,675     | 3                    | 610       | 72      | 5,725     |
| 30                                              | Oklahoma.....                       | 14                  | 321        | 10          | 60        | 15      | 236       |                 | 9         |         | 49        | 10                   | 51        | 15      | 187       |
| 31                                              | Oregon.....                         | 11                  | 52         |             |           |         | 52        |                 |           |         | 3         |                      |           |         | 49        |
| 32                                              | Pennsylvania.....                   | 45                  | 4,150      |             | 157       | 1,338   | 2,655     | 31              | 1,338     | 1,653   |           |                      | 126       |         | 1,002     |
| 33                                              | South Carolina.....                 | 17                  | 784        |             | 46        |         | 738       |                 |           |         |           |                      | 46        |         | 738       |
| 34                                              | South Dakota.....                   | 8                   | 311        |             | 13        |         | 298       |                 | 12        |         | 11        |                      | 1         |         | 287       |
| 35                                              | Tennessee.....                      | 28                  | 1,728      | 10          | 58        | 45      | 1,615     |                 | 12        | 31      | 105       | 10                   | 46        | 14      | 1,510     |
| 36                                              | Texas.....                          | 9                   | 1,053      |             | 191       | 264     | 598       |                 | 10        | 264     | 125       |                      | 181       |         | 473       |
| 37                                              | Utah.....                           | 9                   | 147        |             | 90        | 4       | 53        |                 |           |         |           |                      | 90        | 4       | 53        |
| 38                                              | Vermont.....                        | 13                  | 344        | 2           | 14        | 45      | 283       |                 |           | 45      |           | 2                    | 14        |         | 283       |
| 39                                              | Virginia.....                       | 14                  | 604        |             | 27        | 147     | 520       |                 |           | 147     | 212       |                      | 27        |         | 308       |
| 40                                              | Washington.....                     | 6                   | 2,221      |             | 820       |         | 1,401     |                 |           |         |           |                      | 820       |         | 1,401     |
| 41                                              | West Virginia.....                  | 5                   | 728        |             |           | 558     | 170       |                 |           | 558     | 130       |                      |           |         | 40        |
| 42                                              | Wisconsin.....                      | 64                  | 1,734      |             | 278       | 140     | 1,316     |                 | 48        | 140     | 247       |                      | 230       |         | 1,099     |
| 43                                              | All other states <sup>1</sup> ..... | 5                   | 231        | 8           | 42        | 15      | *166      | 8               | 19        | 15      | 109       |                      | 23        |         | 57        |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## OF SERVICE, BY STATES AND TERRITORIES: 1907.

| INCANDESCENT LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |             |         |                 |         |                 |         |                        |         | OTHER VARIETIES OF LAMPS—NEONST, VACUUM, VAPOR, ETC. |         | STATIONARY MOTORS. |              |    |
|----------------------------------------------------------|-------------|---------|-----------------|---------|-----------------|---------|------------------------|---------|------------------------------------------------------|---------|--------------------|--------------|----|
| Aggregate.                                               | Total.      |         | 16-candlepower. |         | 32-candlepower. |         | All other candlepower. |         | Commercial.                                          | Public. | Number.            | Horse-power. |    |
|                                                          | Commercial. | Public. | Commercial.     | Public. | Commercial.     | Public. | Commercial.            | Public. |                                                      |         |                    |              |    |
| 4,052,448                                                | 3,882,211   | 170,237 | 3,369,506       | 117,866 | 137,026         | 29,169  | 375,679                | 23,202  | 7,738                                                | 1,132   | 4,507              | 31,689       | 1  |
| 42,223                                                   | 40,522      | 1,701   | 39,476          | 1,479   | 820             | 133     | 226                    | 89      | 2                                                    |         | 42                 | 238          | 2  |
| 27,312                                                   | 26,685      | 627     | 23,435          | 123     | 1,350           | 302     | 1,900                  | 202     |                                                      |         | 6                  | 10           | 3  |
| 111,209                                                  | 107,353     | 3,826   | 91,607          | 1,878   | 3,114           | 1,018   | 12,662                 | 930     | 100                                                  | 62      | 295                | 2,206        | 4  |
| 15,976                                                   | 15,804      | 172     | 14,441          | 43      | 933             | 93      | 430                    | 36      | 33                                                   |         | 15                 | 133          | 5  |
| 53,177                                                   | 52,576      | 601     | 52,326          |         | 250             | 401     |                        | 200     | 15                                                   |         | 155                | 1,132        | 6  |
| 9,925                                                    | 9,105       | 820     | 8,355           | 500     |                 | 140     | 750                    | 180     |                                                      |         | 1                  | 4            | 7  |
| 88,169                                                   | 86,696      | 1,473   | 82,122          | 1,000   | 3,440           | 251     | 1,134                  | 222     |                                                      |         | 121                | 915          | 8  |
| 114,454                                                  | 111,614     | 2,840   | 90,893          | 1,970   | 9,457           | 229     | 11,264                 | 641     | 3                                                    |         | 87                 | 477          | 9  |
| 203,659                                                  | 186,031     | 17,628  | 157,425         | 13,008  | 4,850           | 2,908   | 23,756                 | 1,712   | 202                                                  | 285     | 67                 | 256          | 10 |
| 298,160                                                  | 293,436     | 4,724   | 258,953         | 3,756   | 9,547           | 752     | 24,936                 | 216     | 255                                                  |         | 407                | 3,342        | 11 |
| 141,168                                                  | 136,640     | 4,528   | 118,663         | 1,188   | 7,193           | 2,800   | 10,784                 | 540     | 8                                                    | 30      | 202                | 611          | 12 |
| 79,420                                                   | 77,642      | 1,778   | 67,278          | 1,329   | 5,409           | 328     | 4,955                  | 121     | 35                                                   | 133     | 211                | 1,076        | 13 |
| 54,426                                                   | 52,794      | 1,632   | 48,562          | 1,320   | 1,893           | 132     | 2,339                  | 180     | 150                                                  |         | 76                 | 566          | 14 |
| 44,096                                                   | 42,193      | 1,903   | 39,874          | 1,105   | 1,205           | 544     | 1,114                  | 254     | 8                                                    |         | 17                 | 45           | 15 |
| 8,806                                                    | 6,279       | 2,527   | 5,479           | 1,850   | 300             | 132     | 500                    | 545     |                                                      |         | 8                  | 27           | 16 |
| 11,632                                                   | 7,797       | 3,835   | 7,405           | 3,591   | 50              | 188     | 342                    | 56      | 20                                                   |         | 45                 | 412          | 17 |
| 223,293                                                  | 211,914     | 11,379  | 205,568         | 5,816   | 913             | 1,932   | 5,433                  | 3,631   | 395                                                  | 84      | 507                | 4,388        | 18 |
| 418,258                                                  | 385,648     | 32,610  | 329,063         | 29,752  | 10,762          | 1,796   | 45,823                 | 1,062   | 1,083                                                | 285     | 328                | 2,009        | 19 |
| 270,880                                                  | 264,608     | 6,272   | 229,954         | 3,392   | 13,449          | 2,448   | 21,205                 | 432     | 626                                                  |         | 300                | 1,643        | 20 |
| 88,008                                                   | 86,625      | 1,383   | 75,819          | 578     | 4,654           | 524     | 6,162                  | 281     | 2                                                    |         | 27                 | 307          | 21 |
| 133,178                                                  | 129,733     | 3,445   | 121,335         | 683     | 2,609           | 1,187   | 5,789                  | 1,575   | 58                                                   |         | 86                 | 1,515        | 22 |
| 81,227                                                   | 78,458      | 2,769   | 72,285          | 2,211   | 4,240           | 365     | 1,933                  | 193     | 169                                                  |         | 55                 | 196          | 23 |
| 13,572                                                   | 13,099      | 473     | 8,029           |         | 720             | 90      | 4,350                  | 383     |                                                      |         |                    |              | 24 |
| 28,154                                                   | 26,740      | 1,414   | 26,140          | 400     | 200             | 713     | 400                    | 301     | 100                                                  |         | 20                 | 81           | 25 |
| 183,729                                                  | 177,106     | 6,623   | 114,545         | 5,745   | 3,541           | 315     | 59,020                 | 563     | 25                                                   | 140     | 113                | 951          | 26 |
| 98,703                                                   | 96,877      | 1,826   | 79,875          | 982     | 4,642           | 338     | 12,360                 | 506     | 34                                                   |         | 81                 | 929          | 27 |
| 23,604                                                   | 23,265      | 339     | 19,009          | 185     | 1,406           | 74      | 2,850                  | 80      | 100                                                  |         | 15                 | 46           | 28 |
| 361,179                                                  | 347,199     | 13,980  | 307,608         | 11,389  | 9,396           | 1,436   | 30,295                 | 1,155   | 211                                                  | 22      | 338                | 1,681        | 29 |
| 17,613                                                   | 17,085      | 528     | 14,345          | 368     | 1,665           | 100     | 1,075                  | 60      | 5                                                    |         | 8                  | 25           | 30 |
| 10,145                                                   | 9,776       | 369     | 6,860           | 123     | 131             | 183     | 2,785                  | 63      |                                                      |         | 2                  | 8            | 31 |
| 127,759                                                  | 114,576     | 13,183  | 102,937         | 11,808  | 2,878           | 1,296   | 8,761                  | 79      | 127                                                  |         | 108                | 790          | 32 |
| 46,624                                                   | 45,199      | 1,425   | 39,478          | 1,061   | 3,364           | 225     | 2,357                  | 139     | 6                                                    |         | 71                 | 451          | 33 |
| 36,010                                                   | 35,096      | 914     | 31,078          | 700     | 212             | 211     | 3,806                  | 3       | 10                                                   |         | 9                  | 39           | 34 |
| 53,156                                                   | 48,996      | 4,160   | 44,390          | 1,953   | 2,206           | 977     | 2,400                  | 1,230   | 20                                                   |         | 18                 | 280          | 35 |
| 26,812                                                   | 24,592      | 2,220   | 24,460          | 1,280   | 132             | 166     |                        | 774     |                                                      |         | 90                 | 566          | 36 |
| 22,670                                                   | 21,231      | 1,439   | 16,326          | 616     | 1,612           | 523     | 3,293                  | 300     | 7                                                    |         | 81                 | 540          | 37 |
| 63,136                                                   | 61,683      | 1,453   | 50,059          | 105     | 1,818           | 652     | 9,806                  | 696     | 237                                                  |         | 66                 | 722          | 38 |
| 30,338                                                   | 29,825      | 513     | 28,471          | 235     | 593             | 185     | 761                    | 93      |                                                      |         | 98                 | 864          | 39 |
| 215,242                                                  | 210,161     | 5,061   | 166,989         | 872     | 9,230           | 1,438   | 33,942                 | 2,771   | 3,532                                                | 88      | 215                | 1,734        | 40 |
| 3,108                                                    | 2,848       | 260     | 2,048           | 48      | 63              | 208     | 737                    | 4       |                                                      |         | 2                  | 40           | 41 |
| 157,392                                                  | 152,109     | 5,283   | 135,341         | 3,255   | 5,069           | 1,346   | 11,679                 | 682     | 94                                                   | 3       | 81                 | 378          | 42 |
| 14,846                                                   | 14,565      | 281     | 11,300          | 169     | 1,690           | 90      | 1,575                  | 22      | 66                                                   |         | 33                 | 57           | 43 |

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 139.—MUNICIPAL CENTRAL ELECTRIC STATIONS—CHARACTER OF SERVICE, BONDS, AND COST OF CONSTRUCTION AND EQUIPMENT, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | NUMBER OF STATIONS. |                  |            |                       |         |               |         |                    |                             | BONDS.       |              |             | COST OF CONSTRUCTION AND EQUIPMENT. |                  |
|-------------------------------------|---------------------|------------------|------------|-----------------------|---------|---------------|---------|--------------------|-----------------------------|--------------|--------------|-------------|-------------------------------------|------------------|
|                                     | Total.              | Class.           |            | Character of service. |         |               |         |                    |                             | Par value.   |              | Interest.   | Total.                              | During the year. |
|                                     |                     | Purely electric. | Composite. | Lighting.             |         |               |         | Stationary motors. | All other electric service. | Authorized.  | Outstanding. |             |                                     |                  |
|                                     |                     |                  |            | Arc.                  |         | Incandescent. |         |                    |                             |              |              |             |                                     |                  |
|                                     |                     |                  |            | Com-mercial.          | Public. | Com-mercial.  | Public. |                    |                             |              |              |             |                                     |                  |
| United States.....                  | 1,252               | 521              | 731        | 541                   | 1,092   | 1,153         | 1,018   | 350                | 168                         | \$29,031,638 | \$25,343,654 | \$1,149,432 | \$42,879,447                        | \$5,166,365      |
| Alabama.....                        | 28                  | 6                | 22         | 10                    | 27      | 28            | 24      | 6                  | 2                           | 538,500      | 508,500      | 26,225      | 489,817                             | 65,420           |
| Arkansas.....                       | 13                  | 6                | 7          | 6                     | 12      | 11            | 10      | 2                  | 3                           | 231,600      | 195,100      | 10,736      | 417,056                             | 17,757           |
| California.....                     | 14                  | 6                | 8          | 7                     | 12      | 12            | 13      | 10                 | 3                           | 493,000      | 406,400      | 19,433      | 908,974                             | 394,315          |
| Colorado.....                       | 7                   | 4                | 3          | 2                     | 4       | 7             | 7       | 2                  | 2                           | 25,700       | 22,700       | 1,257       | 120,643                             | 10,971           |
| Connecticut.....                    | 5                   | 3                | 2          | 3                     | 4       | 5             | 5       | 3                  | 2                           | 737,500      | 737,500      | 33,150      | 719,708                             | 56,664           |
| Delaware.....                       | 6                   | 1                | 5          | 1                     | 3       | 6             | 6       | 1                  | 1                           | 126,000      | 117,500      | 5,255       | 109,611                             | 1,395            |
| Florida.....                        | 13                  | 5                | 8          | 5                     | 12      | 13            | 12      | 3                  | 1                           | 357,500      | 350,500      | 17,790      | 818,866                             | 120,856          |
| Georgia.....                        | 59                  | 22               | 37         | 21                    | 58      | 57            | 58      | 11                 | 1                           | 1,045,500    | 971,400      | 48,517      | 1,127,504                           | 103,852          |
| Illinois.....                       | 112                 | 59               | 53         | 21                    | 92      | 87            | 83      | 14                 | 3                           | 791,990      | 427,140      | 20,344      | 5,946,525                           | 779,486          |
| Indiana.....                        | 68                  | 23               | 45         | 38                    | 62      | 63            | 48      | 24                 | 8                           | 1,012,228    | 726,551      | 37,668      | 2,253,178                           | 296,075          |
| Iowa.....                           | 51                  | 22               | 29         | 29                    | 41      | 47            | 47      | 16                 | 8                           | 428,800      | 338,830      | 17,212      | 1,032,677                           | 87,537           |
| Kansas.....                         | 32                  | 17               | 15         | 15                    | 29      | 29            | 23      | 14                 | 5                           | 472,000      | 426,000      | 18,639      | 747,197                             | 101,596          |
| Kentucky.....                       | 14                  | 10               | 4          | 3                     | 12      | 12            | 9       | 3                  | 3                           | 74,000       | 65,500       | 3,245       | 524,644                             | 18,658           |
| Louisiana.....                      | 21                  | 3                | 18         | 11                    | 17      | 21            | 21      | 6                  | 13                          | 535,500      | 314,650      | 18,518      | 476,860                             | 53,017           |
| Maine.....                          | 4                   | 4                | .....      | 1                     | 3       | 2             | 3       | 2                  | .....                       | 54,320       | 54,320       | 2,616       | 185,303                             | 8,591            |
| Maryland.....                       | 8                   | 5                | 3          | 1                     | 4       | 4             | 6       | 1                  | .....                       | 135,000      | 127,000      | 5,250       | 238,280                             | 19,184           |
| Massachusetts.....                  | 24                  | 17               | 7          | 14                    | 19      | 24            | 23      | 18                 | 6                           | 2,042,870    | 1,814,312    | 68,760      | 2,755,981                           | 357,737          |
| Michigan.....                       | 104                 | 28               | 76         | 55                    | 100     | 96            | 89      | 26                 | 17                          | 2,770,375    | 2,429,601    | 107,597     | 4,344,825                           | 450,238          |
| Minnesota.....                      | 92                  | 18               | 74         | 61                    | 86      | 92            | 85      | 31                 | 14                          | 1,230,050    | 1,096,050    | 54,071      | 1,945,328                           | 241,760          |
| Mississippi.....                    | 39                  | 5                | 34         | 12                    | 30      | 39            | 28      | 8                  | 20                          | 1,395,200    | 1,370,600    | 72,038      | 899,106                             | 57,368           |
| Missouri.....                       | 58                  | 36               | 22         | 21                    | 49      | 55            | 45      | 6                  | 3                           | 1,338,550    | 1,081,200    | 50,189      | 1,311,189                           | 136,801          |
| Nebraska.....                       | 25                  | 4                | 21         | 10                    | 19      | 24            | 20      | 4                  | .....                       | 298,100      | 290,100      | 10,739      | 508,985                             | 74,560           |
| New Hampshire.....                  | 4                   | 3                | 1          | 1                     | .....   | 4             | 4       | .....              | .....                       | 200,000      | 200,000      | 7,000       | 76,849                              | 2,469            |
| New Jersey.....                     | 7                   | 2                | 5          | 2                     | 5       | 7             | 6       | 3                  | 1                           | 178,520      | 178,520      | 6,976       | 258,433                             | 26,671           |
| New York.....                       | 47                  | 29               | 18         | 16                    | 42      | 41            | 31      | 16                 | 3                           | 1,054,090    | 889,200      | 34,453      | 1,532,127                           | 156,609          |
| North Carolina.....                 | 36                  | 17               | 19         | 17                    | 33      | 36            | 29      | 12                 | 3                           | 990,900      | 923,400      | 48,132      | 816,279                             | 97,101           |
| North Dakota.....                   | 8                   | 1                | 7          | 3                     | 8       | 7             | 6       | 1                  | 1                           | 108,040      | 108,040      | 5,902       | 145,012                             | 28,993           |
| Ohio.....                           | 105                 | 47               | 58         | 50                    | 103     | 98            | 79      | 29                 | 19                          | 3,425,725    | 2,873,260    | 130,258     | 3,424,494                           | 380,677          |
| Oklahoma.....                       | 14                  | 3                | 11         | 9                     | 14      | 14            | 12      | 2                  | 3                           | 480,000      | 480,000      | 22,560      | 202,350                             | 39,194           |
| Oregon.....                         | 11                  | 3                | 8          | .....                 | 5       | 11            | 11      | 1                  | 2                           | 274,500      | 235,100      | 10,638      | 121,646                             | 14,342           |
| Pennsylvania.....                   | 45                  | 36               | 9          | 20                    | 41      | 36            | 36      | 14                 | 2                           | 1,245,300    | 1,168,200    | 47,654      | 1,667,064                           | 87,666           |
| South Carolina.....                 | 17                  | 7                | 10         | 11                    | 17      | 17            | 16      | 10                 | 6                           | 305,500      | 305,500      | 16,165      | 412,526                             | 45,908           |
| South Dakota.....                   | 8                   | 3                | 5          | 3                     | 8       | 6             | 6       | 1                  | .....                       | 41,500       | 41,500       | 2,155       | 198,695                             | 20,549           |
| Tennessee.....                      | 28                  | 5                | 23         | 7                     | 21      | 26            | 19      | 6                  | 1                           | 765,200      | 739,700      | 35,345      | 841,434                             | 64,428           |
| Texas.....                          | 9                   | 1                | 8          | 5                     | 8       | 6             | 8       | 3                  | 1                           | 106,000      | 96,000       | 4,950       | 407,852                             | 71,937           |
| Utah.....                           | 9                   | 9                | .....      | 5                     | 5       | 9             | 9       | 6                  | 1                           | 197,880      | 191,880      | 9,085       | 335,156                             | 21,611           |
| Vermont.....                        | 13                  | 10               | 3          | 4                     | 5       | 13            | 12      | 9                  | 5                           | 476,000      | 388,200      | 15,100      | 581,591                             | 56,676           |
| Virginia.....                       | 14                  | 11               | 3          | 3                     | 11      | 12            | 9       | 4                  | 2                           | 245,000      | 240,000      | 10,390      | 452,014                             | 31,342           |
| Washington.....                     | 6                   | 6                | .....      | 4                     | 4       | 6             | 6       | 4                  | 1                           | 1,868,000    | 1,597,500    | 54,825      | 2,168,305                           | 432,465          |
| West Virginia.....                  | 5                   | 4                | 1          | .....                 | 4       | 3             | 3       | 1                  | .....                       | 41,500       | 31,200       | 1,469       | 100,872                             | 990              |
| Wisconsin.....                      | 64                  | 18               | 46         | 29                    | 59      | 62            | 53      | 13                 | 6                           | 789,700      | 682,500      | 31,237      | 1,097,057                           | 114,743          |
| All other states <sup>1</sup> ..... | 5                   | 2                | 3          | 5                     | 4       | 5             | 4       | 4                  | 1                           | 103,000      | 102,500      | 5,889       | 127,322                             | 18,254           |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## GENERAL TABLES.

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TABLE 140.—MUNICIPAL CENTRAL ELECTRIC STATIONS—CONDENSED STATEMENT: INCOME AND EXPENSES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | INCOME.       |                   |              |                    |            | EXPENSES.          |             |                     |                                        |                                                            |
|-------------------------------------|---------------------|---------------|-------------------|--------------|--------------------|------------|--------------------|-------------|---------------------|----------------------------------------|------------------------------------------------------------|
|                                     |                     | Gross income. | Electric service. |              |                    |            | All other sources. | Total.      | Salaries and wages. | Cost of supplies, materials, and fuel. | Rents, taxes, insurance, and other miscellaneous expenses. |
|                                     |                     |               | Total.            | Lighting.    | Stationary motors. | All other. |                    |             |                     |                                        |                                                            |
| United States.....                  | 1,252               | \$14,011,999  | \$13,614,434      | \$13,040,263 | \$516,373          | \$57,798   | \$397,565          | \$9,167,188 | \$3,485,015         | \$4,967,687                            | \$714,486                                                  |
| Alabama.....                        | 28                  | 185,576       | 182,216           | 178,674      | 3,292              | 250        | 3,360              | 121,914     | 42,970              | 72,212                                 | 6,732                                                      |
| Arkansas.....                       | 13                  | 122,471       | 121,830           | 120,255      | 392                | 1,183      | 641                | 87,928      | 31,350              | 50,897                                 | 5,681                                                      |
| California.....                     | 14                  | 290,987       | 284,225           | 229,089      | 52,875             | 2,261      | 6,762              | 108,797     | 63,412              | 96,261                                 | 9,124                                                      |
| Colorado.....                       | 7                   | 52,177        | 51,317            | 49,637       | 1,680              | 800        | 800                | 31,491      | 12,380              | 17,221                                 | 1,890                                                      |
| Connecticut.....                    | 5                   | 163,765       | 163,685           | 144,897      | 18,421             | 367        | 80                 | 88,618      | 33,103              | 43,548                                 | 11,967                                                     |
| Delaware.....                       | 6                   | 42,166        | 41,876            | 40,819       | 25                 | 1,032      | 290                | 33,803      | 12,815              | 16,504                                 | 4,484                                                      |
| Florida.....                        | 13                  | 380,229       | 370,342           | 358,664      | 10,878             | 800        | 9,887              | 218,585     | 78,569              | 131,800                                | 8,214                                                      |
| Georgia.....                        | 59                  | 453,495       | 441,826           | 436,106      | 5,220              | 500        | 11,069             | 272,545     | 111,068             | 146,186                                | 15,291                                                     |
| Illinois.....                       | 112                 | 1,505,061     | 1,498,256         | 1,491,343    | 5,607              | 1,306      | 6,805              | 1,067,265   | 445,849             | 576,620                                | 44,796                                                     |
| Indiana.....                        | 68                  | 857,499       | 837,887           | 799,749      | 35,939             | 2,199      | 19,612             | 584,293     | 197,221             | 340,902                                | 46,170                                                     |
| Iowa.....                           | 51                  | 416,789       | 390,874           | 366,851      | 13,563             | 460        | 35,915             | 302,733     | 99,283              | 175,341                                | 28,109                                                     |
| Kansas.....                         | 32                  | 232,228       | 219,928           | 211,634      | 7,356              | 938        | 12,300             | 157,461     | 67,866              | 77,252                                 | 12,344                                                     |
| Kentucky.....                       | 14                  | 179,987       | 177,787           | 163,798      | 13,989             | .....      | 2,200              | 106,247     | 39,830              | 56,570                                 | 8,947                                                      |
| Louisiana.....                      | 21                  | 242,547       | 241,637           | 229,227      | 2,104              | 10,306     | 910                | 183,016     | 54,027              | 110,498                                | 18,491                                                     |
| Maine.....                          | 4                   | 69,994        | 68,801            | 68,476       | 325                | .....      | 1,193              | 32,741      | 19,550              | 7,790                                  | 5,401                                                      |
| Maryland.....                       | 8                   | 92,145        | 90,222            | 86,102       | 4,120              | .....      | 1,923              | 73,645      | 27,926              | 39,905                                 | 5,814                                                      |
| Massachusetts.....                  | 24                  | 749,709       | 732,161           | 636,221      | 94,083             | 1,857      | 17,548             | 469,656     | 169,393             | 243,815                                | 56,448                                                     |
| Michigan.....                       | 104                 | 1,233,086     | 1,175,934         | 1,140,216    | 30,236             | 5,482      | 57,152             | 790,195     | 319,133             | 405,901                                | 65,161                                                     |
| Minnesota.....                      | 92                  | 771,219       | 718,565           | 685,939      | 30,426             | 2,200      | 52,654             | 552,753     | 190,414             | 328,703                                | 45,636                                                     |
| Mississippi.....                    | 39                  | 328,882       | 318,099           | 306,168      | 5,389              | 5,142      | 10,183             | 218,025     | 80,777              | 115,678                                | 21,570                                                     |
| Missouri.....                       | 58                  | 503,878       | 494,423           | 473,411      | 14,611             | 6,401      | 9,455              | 343,369     | 116,568             | 190,797                                | 36,004                                                     |
| Nebraska.....                       | 25                  | 218,589       | 214,497           | 206,997      | 7,500              | .....      | 4,092              | 122,016     | 44,875              | 69,356                                 | 7,785                                                      |
| New Hampshire.....                  | 4                   | 22,287        | 21,652            | 21,652       | .....              | .....      | 635                | 11,913      | 5,660               | 4,816                                  | 1,437                                                      |
| New Jersey.....                     | 7                   | 70,069        | 69,673            | 66,116       | 1,057              | 2,500      | 396                | 37,588      | 15,846              | 18,049                                 | 3,693                                                      |
| New York.....                       | 47                  | 448,462       | 438,840           | 427,338      | 10,903             | 599        | 9,622              | 300,104     | 126,833             | 150,331                                | 22,940                                                     |
| North Carolina.....                 | 36                  | 313,440       | 307,797           | 296,013      | 11,634             | 150        | 5,643              | 213,491     | 72,054              | 126,722                                | 14,715                                                     |
| North Dakota.....                   | 8                   | 70,742        | 69,974            | 68,572       | 1,384              | 18         | 6,768              | 68,523      | 22,741              | 39,152                                 | 6,630                                                      |
| Ohio.....                           | 105                 | 1,135,279     | 1,106,915         | 1,083,367    | 19,470             | 4,078      | 28,364             | 742,418     | 294,961             | 381,695                                | 65,762                                                     |
| Oklahoma.....                       | 14                  | 86,371        | 84,801            | 83,562       | 780                | 459        | 1,570              | 64,411      | 26,946              | 32,628                                 | 4,837                                                      |
| Oregon.....                         | 11                  | 41,943        | 40,563            | 40,319       | 33                 | 211        | 1,380              | 28,452      | 11,003              | 15,543                                 | 1,906                                                      |
| Pennsylvania.....                   | 45                  | 660,151       | 653,656           | 635,825      | 17,761             | 70         | 6,495              | 388,717     | 154,273             | 206,547                                | 27,897                                                     |
| South Carolina.....                 | 17                  | 147,526       | 132,667           | 128,235      | 3,785              | 647        | 14,859             | 117,125     | 36,052              | 76,693                                 | 4,380                                                      |
| South Dakota.....                   | 8                   | 73,915        | 71,962            | 71,202       | 780                | .....      | 1,933              | 57,179      | 18,540              | 33,053                                 | 5,586                                                      |
| Tennessee.....                      | 28                  | 287,540       | 274,828           | 254,362      | 19,766             | 700        | 12,712             | 169,610     | 67,513              | 85,573                                 | 16,524                                                     |
| Texas.....                          | 9                   | 207,234       | 207,234           | 191,773      | 14,844             | 617        | .....              | 119,918     | 42,888              | 64,890                                 | 12,140                                                     |
| Utah.....                           | 9                   | 57,134        | 57,026            | 50,327       | 6,519              | 180        | 108                | 32,271      | 19,527              | 8,004                                  | 4,740                                                      |
| Vermont.....                        | 13                  | 109,418       | 103,916           | 94,401       | 7,216              | 2,299      | 5,502              | 68,893      | 25,590              | 27,353                                 | 15,950                                                     |
| Virginia.....                       | 14                  | 137,573       | 134,618           | 119,637      | 14,350             | 631        | 2,955              | 76,348      | 28,667              | 43,444                                 | 4,237                                                      |
| Washington.....                     | 6                   | 535,662       | 528,188           | 504,485      | 22,044             | 1,659      | 7,474              | 268,868     | 132,463             | 124,665                                | 11,740                                                     |
| West Virginia.....                  | 5                   | 54,735        | 54,695            | 54,295       | 400                | .....      | 40                 | 46,062      | 20,550              | 24,618                                 | 894                                                        |
| Wisconsin.....                      | 64                  | 378,730       | 353,517           | 348,425      | 4,856              | 236        | 25,213             | 284,179     | 96,818              | 169,089                                | 18,272                                                     |
| All other states <sup>1</sup> ..... | 5                   | 75,309        | 74,904            | 74,064       | 760                | 60         | 405                | 45,024      | 17,712              | 21,065                                 | 6,247                                                      |

<sup>1</sup>Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 141.—MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF

| 1  | STATE OR TERRITORY.                 | Number of stations. | Aggregate cost. | SUPPLIES AND MATERIALS. |         |          |         |         |               |          |                     |           |
|----|-------------------------------------|---------------------|-----------------|-------------------------|---------|----------|---------|---------|---------------|----------|---------------------|-----------|
|    |                                     |                     |                 | Total cost.             | Meters. |          | Motors. |         | Transformers. |          | Incandescent lamps. |           |
|    |                                     |                     |                 |                         | Number. | Cost.    | Number. | Cost.   | Number.       | Cost.    | Number.             | Cost.     |
| 1  | United States.....                  | 1,252               | \$4,967,687     | \$1,734,904             | 3,876   | \$48,193 | 124     | \$7,749 | 1,294         | \$49,120 | 771,643             | \$144,558 |
| 2  | Alabama.....                        | 28                  | 72,212          | 14,323                  | 40      | 432      | 3       | 320     | 37            | 1,751    | 7,259               | 1,274     |
| 3  | Arkansas.....                       | 13                  | 50,897          | 12,082                  | 20      | 262      |         |         | 12            | 493      | 8,849               | 1,574     |
| 4  | California.....                     | 14                  | 96,261          | 55,978                  | 7       | 88       |         |         | 2             | 139      | 12,536              | 2,073     |
| 5  | Colorado.....                       | 7                   | 17,221          | 8,957                   |         |          |         |         |               |          | 3,495               | 693       |
| 6  | Connecticut.....                    | 5                   | 43,548          | 8,410                   | 1       | 12       |         |         | 2             | 35       | 12,174              | 2,118     |
| 7  | Delaware.....                       | 6                   | 16,504          | 5,082                   |         |          |         |         |               |          | 3,790               | 696       |
| 8  | Florida.....                        | 13                  | 131,800         | 24,393                  | 8       | 97       |         |         | 2             | 114      | 6,501               | 1,214     |
| 9  | Georgia.....                        | 59                  | 146,186         | 45,339                  | 4       | 48       |         |         | 28            | 897      | 29,836              | 5,117     |
| 10 | Illinois.....                       | 112                 | 576,620         | 210,045                 | 136     | 1,497    |         |         | 100           | 3,570    | 31,241              | 6,804     |
| 11 | Indiana.....                        | 68                  | 340,902         | 116,952                 | 596     | 6,682    | 3       | 318     | 213           | 6,251    | 35,192              | 6,453     |
| 12 | Iowa.....                           | 51                  | 175,341         | 62,996                  | 234     | 3,068    | 3       | 180     | 30            | 1,201    | 37,500              | 7,819     |
| 13 | Kansas.....                         | 32                  | 77,252          | 27,202                  | 60      | 742      |         |         | 16            | 739      | 27,852              | 5,037     |
| 14 | Kentucky.....                       | 14                  | 56,570          | 24,550                  | 20      | 307      |         |         | 19            | 513      | 18,110              | 3,508     |
| 15 | Louisiana.....                      | 21                  | 110,498         | 18,309                  | 45      | 395      |         |         | 41            | 1,370    | 7,624               | 1,817     |
| 16 | Maine.....                          | 4                   | 7,790           | 7,189                   |         |          |         |         |               |          | 2,964               | 527       |
| 17 | Maryland.....                       | 8                   | 39,905          | 8,032                   |         |          |         |         | 2             | 56       | 9,780               | 1,353     |
| 18 | Massachusetts.....                  | 24                  | 243,815         | 119,981                 | 84      | 1,142    | 2       | 34      | 20            | 1,567    | 60,097              | 11,920    |
| 19 | Michigan.....                       | 104                 | 405,901         | 127,602                 | 266     | 2,842    | 6       | 503     | 59            | 2,377    | 91,400              | 17,016    |
| 20 | Minnesota.....                      | 92                  | 328,703         | 91,173                  | 232     | 2,922    | 1       | 85      | 54            | 1,423    | 41,880              | 8,065     |
| 21 | Mississippi.....                    | 39                  | 115,678         | 24,784                  | 83      | 1,109    | 25      | 2,062   | 18            | 525      | 6,165               | 1,164     |
| 22 | Missouri.....                       | 58                  | 190,797         | 49,037                  | 202     | 4,374    |         |         | 113           | 4,226    | 26,095              | 4,754     |
| 23 | Nebraska.....                       | 25                  | 69,356          | 15,107                  | 27      | 387      |         |         | 11            | 557      | 27,973              | 5,224     |
| 24 | New Hampshire.....                  | 4                   | 4,816           | 4,368                   |         |          |         |         | 1             | 27       | 3,354               | 974       |
| 25 | New Jersey.....                     | 7                   | 18,049          | 4,726                   | 57      | 671      | 3       | 210     | 14            | 444      | 1,446               | 430       |
| 26 | New York.....                       | 47                  | 150,331         | 52,099                  | 26      | 297      |         |         | 19            | 712      | 20,017              | 3,795     |
| 27 | North Carolina.....                 | 36                  | 126,722         | 39,915                  | 4       | 46       |         |         | 10            | 377      | 24,488              | 4,535     |
| 28 | North Dakota.....                   | 8                   | 39,152          | 9,787                   | 93      | 1,637    | 2       | 15      |               |          | 2,885               | 568       |
| 29 | Ohio.....                           | 105                 | 381,695         | 121,083                 | 657     | 7,925    |         |         | 169           | 8,285    | 56,891              | 10,263    |
| 30 | Oklahoma.....                       | 14                  | 32,628          | 4,941                   | 6       | 73       |         |         | 25            | 888      | 690                 | 116       |
| 31 | Oregon.....                         | 11                  | 15,543          | 5,980                   |         |          |         |         | 4             | 180      | 2,600               | 463       |
| 32 | Pennsylvania.....                   | 45                  | 206,547         | 84,587                  | 171     | 1,938    | 2       | 158     | 40            | 1,782    | 34,139              | 5,621     |
| 33 | South Carolina.....                 | 17                  | 76,693          | 25,810                  | 138     | 1,636    | 24      | 2,310   | 2             | 76       | 9,071               | 1,679     |
| 34 | South Dakota.....                   | 8                   | 33,053          | 13,923                  | 10      | 150      |         |         |               |          | 3,090               | 542       |
| 35 | Tennessee.....                      | 28                  | 85,573          | 25,355                  | 16      | 192      | 9       | 600     | 28            | 970      | 19,519              | 3,501     |
| 36 | Texas.....                          | 9                   | 64,890          | 10,328                  | 2       | 25       |         |         | 9             | 216      | 7,168               | 1,268     |
| 37 | Utah.....                           | 9                   | 8,004           | 5,811                   | 12      | 165      |         |         | 21            | 1,127    | 6,935               | 1,357     |
| 38 | Vermont.....                        | 13                  | 27,353          | 15,468                  | 2       | 42       |         |         | 18            | 729      | 5,525               | 1,267     |
| 39 | Virginia.....                       | 14                  | 43,444          | 22,224                  | 124     | 1,496    |         |         | 92            | 2,606    | 9,180               | 1,872     |
| 40 | Washington.....                     | 6                   | 124,665         | 121,465                 | 300     | 3,150    | 5       | 300     |               |          | 13,930              | 2,153     |
| 41 | West Virginia.....                  | 5                   | 24,618          | 14,404                  |         |          |         |         | 1             | 30       | 310                 | 71        |
| 42 | Wisconsin.....                      | 64                  | 169,089         | 66,325                  | 163     | 1,973    | 36      | 654     | 44            | 2,060    | 37,992              | 7,045     |
| 43 | All other states <sup>1</sup> ..... | 5                   | 21,065          | 8,782                   | 30      | 371      |         |         | 18            | 807      | 4,100               | 826       |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## GENERAL TABLES.

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## SUPPLIES, MATERIALS, AND FUEL, BY STATES AND TERRITORIES: 1907.

| SUPPLIES AND MATERIALS—continued.                  |                                                    |                                                                              |                                  |                        |                                                                                            |                  |          |                                                               |                                            | COST OF FUEL. |             |                  |              |                 |    |
|----------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------|----------------------------------|------------------------|--------------------------------------------------------------------------------------------|------------------|----------|---------------------------------------------------------------|--------------------------------------------|---------------|-------------|------------------|--------------|-----------------|----|
| Nernst lamps, vacuum and vapor lamps, etc. (cost). | Lamp fittings, etc. (except for arc lamps) (cost). | Carbons, globes, hoods, and other supplies for arc lamps and repairs (cost). | Poles and other supports (cost). | Wire and cable (cost). | All other supplies and materials, including water for boilers, mill supplies, etc. (cost). | Power purchased. |          | Rent of water privileges for water wheels or turbines (cost). | Freight not included in cost of materials. | Total.        | Coal.       | Crude petroleum. | Natural gas. | All other fuel. |    |
| \$3,956                                            | \$86,254                                           | \$241,278                                                                    | \$56,298                         | \$146,031              | \$443,547                                                                                  | \$336,332        | \$41,952 | \$35,109                                                      | \$94,527                                   | \$3,232,783   | \$2,900,328 | \$128,547        | \$40,467     | \$163,431       | 1  |
| 503                                                | 1,542                                              | 1,487                                                                        | 1,528                            | 4,886                  | 2,809                                                                                      | 2,000            | 600      | 57,889                                                        | 49,488                                     | 57,889        | 49,488      |                  |              | 8,401           | 2  |
| 85                                                 | 1,617                                              | 1,367                                                                        | 1,415                            | 2,809                  | 4,514                                                                                      | 37,640           | 400      | 38,815                                                        | 36,710                                     | 38,815        | 36,710      |                  |              | 2,105           | 3  |
| 1,978                                              | 3,540                                              | 1,321                                                                        | 4,685                            | 4,514                  | 853                                                                                        | 6,702            |          | 40,283                                                        |                                            | 40,283        |             | 33,083           |              | 6,600           | 4  |
| 173                                                | 275                                                | 77                                                                           | 84                               | 853                    | 2,922                                                                                      |                  |          | 8,264                                                         |                                            | 8,264         |             |                  |              |                 | 5  |
|                                                    | 1,635                                              | 995                                                                          | 693                              | 2,922                  |                                                                                            |                  |          | 35,138                                                        |                                            | 35,138        |             | 27,103           | 3,392        | 4,653           | 6  |
| 18                                                 | 337                                                | 45                                                                           | 25                               | 1,287                  | 574                                                                                        |                  | 2,094    | 11,422                                                        |                                            | 11,422        |             |                  |              |                 | 7  |
| 2,023                                              | 5,106                                              | 1,143                                                                        | 2,121                            | 12,442                 |                                                                                            |                  | 133      | 107,407                                                       |                                            | 107,407       |             |                  |              | 21,462          | 8  |
| 3,577                                              | 4,849                                              | 2,802                                                                        | 4,991                            | 10,622                 | 9,310                                                                                      |                  | 2,953    | 100,847                                                       |                                            | 100,847       |             |                  |              | 24,764          | 9  |
| 150                                                | 58,762                                             | 5,374                                                                        | 11,215                           | 58,463                 | 53,579                                                                                     | 4,100            | 7,955    | 366,575                                                       |                                            | 366,575       |             | 1,800            | 1,800        | 2,930           | 10 |
| 230                                                | 16,474                                             | 2,941                                                                        | 10,217                           | 26,067                 | 11,244                                                                                     | 11,600           | 75       | 223,950                                                       |                                            | 223,950       |             |                  | 2,639        | 44              | 11 |
| 135                                                | 4,105                                              | 2,854                                                                        | 2,358                            | 8,957                  | 20,827                                                                                     | 1,940            | 9,552    | 112,345                                                       |                                            | 112,345       |             |                  |              | 160             | 12 |
| 16                                                 | 5,511                                              | 2,262                                                                        | 1,236                            | 7,539                  | 7,539                                                                                      | 1,709            | 1,164    | 50,050                                                        |                                            | 50,050        |             |                  | 7,585        | 500             | 13 |
|                                                    | 1,564                                              | 5,277                                                                        | 934                              | 11,278                 | 11,278                                                                                     |                  | 829      | 32,020                                                        |                                            | 32,020        |             |                  |              |                 | 14 |
|                                                    | 400                                                | 1,476                                                                        | 384                              | 1,520                  | 9,922                                                                                      |                  | 41       | 92,189                                                        |                                            | 92,189        |             |                  |              | 3,370           | 15 |
|                                                    | 910                                                | 4,191                                                                        | 300                              | 51                     | 907                                                                                        |                  | 303      | 601                                                           |                                            | 601           |             |                  |              |                 | 16 |
| 80                                                 | 2,337                                              | 110                                                                          | 260                              | 3,586                  |                                                                                            |                  | 250      | 31,873                                                        |                                            | 31,873        |             |                  |              | 1,361           | 17 |
| 1,793                                              | 5,598                                              | 4,590                                                                        | 16,063                           | 18,504                 | 39,169                                                                                     |                  | 57       | 123,834                                                       |                                            | 123,834       |             |                  |              | 4,334           | 18 |
| 140                                                | 10,950                                             | 29,396                                                                       | 7,154                            | 11,666                 | 32,871                                                                                     | 7,057            | 2,205    | 278,299                                                       |                                            | 278,299       |             | 2,063            |              | 8,196           | 19 |
| 88                                                 | 4,778                                              | 6,241                                                                        | 2,488                            | 8,426                  | 31,199                                                                                     | 6,775            | 3,000    | 237,530                                                       |                                            | 237,530       |             |                  |              | 22,480          | 20 |
|                                                    | 3,773                                              | 2,205                                                                        | 826                              | 1,768                  | 7,978                                                                                      | 2,849            | 525      | 90,894                                                        |                                            | 90,894        |             |                  |              | 3,291           | 21 |
| 751                                                | 3,731                                              | 6,315                                                                        | 1,695                            | 5,448                  | 13,324                                                                                     |                  | 4,419    | 141,760                                                       |                                            | 141,760       |             | 2,707            | 4,134        | 1,880           | 22 |
|                                                    | 1,661                                              | 1,753                                                                        | 432                              | 1,066                  | 3,074                                                                                      |                  | 963      | 54,249                                                        |                                            | 54,249        |             |                  |              | 329             | 23 |
|                                                    |                                                    |                                                                              | 18                               | 165                    | 384                                                                                        | 1,300            |          | 448                                                           |                                            | 448           |             |                  |              | 22              | 24 |
| 14                                                 | 55                                                 | 354                                                                          | 335                              | 350                    | 1,863                                                                                      |                  |          | 13,323                                                        |                                            | 13,323        |             |                  |              | 72              | 25 |
| 149                                                | 2,641                                              | 6,561                                                                        | 923                              | 4,312                  | 11,693                                                                                     | 16,867           | 1        | 98,232                                                        |                                            | 98,232        |             | 1,982            | 274          | 1,597           | 26 |
|                                                    | 774                                                | 4,057                                                                        | 735                              | 768                    | 9,482                                                                                      | 9,688            | 251      | 86,807                                                        |                                            | 86,807        |             |                  |              | 9,547           | 27 |
|                                                    | 103                                                | 566                                                                          | 573                              | 940                    | 3,625                                                                                      | 9,202            | 1,760    | 29,365                                                        |                                            | 29,365        |             |                  |              | 1,811           | 28 |
| 229                                                | 4,750                                              | 20,918                                                                       | 3,392                            | 10,281                 | 40,051                                                                                     | 2,199            | 11,075   | 260,612                                                       |                                            | 260,612       |             | 3,443            | 14,528       | 3               | 29 |
|                                                    |                                                    | 737                                                                          | 508                              | 159                    | 2,460                                                                                      |                  |          | 27,687                                                        |                                            | 27,687        |             |                  | 2,100        |                 | 30 |
|                                                    | 131                                                | 221                                                                          | 301                              | 548                    | 656                                                                                        | 3,300            | 180      | 9,563                                                         |                                            | 9,563         |             |                  |              | 8,153           | 31 |
| 25                                                 | 3,512                                              | 16,892                                                                       | 2,056                            | 4,400                  | 28,518                                                                                     | 11,896           | 1,736    | 2,759                                                         | 3,294                                      | 121,960       | 112,822     | 2,305            | 3,752        | 3,081           | 32 |
| 44                                                 | 7,026                                              | 2,102                                                                        | 917                              | 2,874                  | 2,946                                                                                      | 4,200            |          |                                                               |                                            | 50,883        | 46,713      |                  |              | 4,120           | 33 |
| 45                                                 | 654                                                | 760                                                                          | 696                              | 619                    | 2,242                                                                                      | 8,215            |          |                                                               |                                            | 19,130        | 17,655      |                  | 1,135        | 340             | 34 |
|                                                    | 2,949                                              | 4,790                                                                        | 845                              | 1,431                  | 6,050                                                                                      | 1,255            | 2,060    |                                                               |                                            | 60,218        | 59,738      |                  |              | 480             | 35 |
|                                                    | 300                                                | 1,968                                                                        | 1,148                            | 2,001                  | 3,382                                                                                      |                  |          |                                                               |                                            | 54,562        | 28,349      | 24,213           |              | 2,000           | 36 |
|                                                    | 203                                                | 290                                                                          | 677                              | 1,260                  | 645                                                                                        |                  |          |                                                               | 87                                         | 2,193         |             |                  |              |                 | 37 |
| 400                                                | 1,978                                              | 699                                                                          | 114                              | 932                    | 2,153                                                                                      | 5,810            | 1,000    |                                                               | 284                                        | 11,885        | 11,885      |                  |              |                 | 38 |
|                                                    | 105                                                | 2,609                                                                        | 719                              | 3,225                  | 4,133                                                                                      | 2,000            | 1,050    |                                                               | 2,349                                      | 21,220        |             |                  |              | 12              | 39 |
| 1,188                                              | 4,686                                              | 4,381                                                                        | 816                              | 7,345                  | 16,754                                                                                     | 80,692           |          |                                                               |                                            | 3,200         | 400         |                  |              | 2,800           | 40 |
|                                                    | 10                                                 | 5,472                                                                        | 316                              | 10                     | 8,460                                                                                      |                  |          |                                                               | 35                                         | 10,214        | 7,694       |                  | 2,520        |                 | 41 |
| 119                                                | 4,770                                              | 3,408                                                                        | 1,948                            | 9,778                  | 12,728                                                                                     | 11,507           | 2,301    | 3,660                                                         | 4,374                                      | 102,764       | 89,928      | 400              |              | 12,436          | 42 |
|                                                    | 216                                                | 371                                                                          | 685                              | 264                    | 2,288                                                                                      | 2,500            |          |                                                               | 454                                        | 12,283        | 12,196      |                  |              | 87              | 43 |

25142-10-12

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 142.—MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF INCOME, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | INCOME.       |                   |                  |             |                    |                           |                                           |                   |                       |            |           | All other sources. |
|-------------------------------------|---------------------|---------------|-------------------|------------------|-------------|--------------------|---------------------------|-------------------------------------------|-------------------|-----------------------|------------|-----------|--------------------|
|                                     |                     | Gross income. | Electric service. |                  |             |                    |                           |                                           |                   |                       |            |           |                    |
|                                     |                     |               | Total.            | Lighting.        |             | Stationary motors. | Electric-railway service. | Current sold to other electric companies. | Electric heating. | Charging automobiles. | All other. |           |                    |
|                                     |                     |               |                   | Commer-<br>cial. | Public.     |                    |                           |                                           |                   |                       |            |           |                    |
| United States.....                  | 1,252               | \$14,011,999  | \$13,614,434      | \$7,394,987      | \$5,645,276 | \$516,373          | \$12,222                  | \$6,444                                   | \$6,350           | \$1,288               | \$31,494   | \$397,565 |                    |
| Alabama.....                        | 28                  | 185,576       | 182,216           | 128,972          | 49,702      | 3,292              |                           |                                           | 140               |                       | 110        | 3,360     |                    |
| Arkansas.....                       | 13                  | 122,471       | 121,830           | 72,681           | 47,574      | 392                |                           |                                           |                   |                       | 1,183      | 641       |                    |
| California.....                     | 14                  | 290,987       | 284,225           | 155,821          | 73,268      | 52,875             |                           |                                           | 1,080             | 47                    | 1,134      | 6,762     |                    |
| Colorado.....                       | 7                   | 52,177        | 51,317            | 42,181           | 7,456       | 1,680              |                           |                                           |                   |                       |            | 860       |                    |
| Connecticut.....                    | 5                   | 163,765       | 163,685           | 103,830          | 41,067      | 18,421             |                           |                                           |                   | 75                    | 292        | 80        |                    |
| Delaware.....                       | 6                   | 42,166        | 41,876            | 27,761           | 13,058      | 25                 | 1,032                     |                                           |                   |                       |            | 290       |                    |
| Florida.....                        | 13                  | 380,229       | 370,342           | 292,039          | 66,025      | 10,878             | 800                       |                                           |                   |                       |            | 9,887     |                    |
| Georgia.....                        | 59                  | 453,495       | 441,826           | 280,349          | 155,757     | 5,220              |                           |                                           |                   |                       | 500        | 11,669    |                    |
| Illinois.....                       | 112                 | 1,505,061     | 1,498,256         | 350,908          | 1,140,435   | 5,607              |                           | 1,170                                     | 100               |                       | 36         | 6,805     |                    |
| Indiana.....                        | 68                  | 857,499       | 837,887           | 531,682          | 268,067     | 35,939             | 1,500                     |                                           | 341               | 283                   | 75         | 19,612    |                    |
| Iowa.....                           | 51                  | 416,789       | 380,874           | 268,746          | 98,105      | 13,563             |                           |                                           | 20                | 160                   | 280        | 35,915    |                    |
| Kansas.....                         | 32                  | 232,228       | 219,928           | 128,217          | 83,417      | 7,356              | 300                       |                                           | 30                | 6                     | 602        | 12,300    |                    |
| Kentucky.....                       | 14                  | 179,987       | 177,787           | 86,977           | 76,821      | 13,989             |                           |                                           |                   |                       |            | 2,200     |                    |
| Louisiana.....                      | 21                  | 242,547       | 241,637           | 163,530          | 65,697      | 2,104              |                           |                                           | 336               |                       | 9,970      | 910       |                    |
| Maine.....                          | 4                   | 69,994        | 68,801            | 7,404            | 61,072      | 325                |                           |                                           |                   |                       |            | 1,193     |                    |
| Maryland.....                       | 8                   | 92,145        | 90,222            | 28,523           | 57,579      | 4,120              |                           |                                           |                   |                       |            | 1,923     |                    |
| Massachusetts.....                  | 24                  | 749,709       | 732,161           | 373,513          | 262,708     | 94,083             |                           | 108                                       | 340               | 313                   | 1,096      | 17,548    |                    |
| Michigan.....                       | 104                 | 1,233,086     | 1,175,934         | 586,227          | 553,989     | 30,236             |                           | 1,677                                     | 220               | 179                   | 3,406      | 57,152    |                    |
| Minnesota.....                      | 92                  | 771,219       | 718,565           | 518,638          | 167,301     | 30,426             |                           |                                           | 1,141             | 55                    | 1,004      | 52,654    |                    |
| Mississippi.....                    | 39                  | 328,882       | 318,099           | 238,113          | 70,065      | 5,389              |                           |                                           | 48                |                       | 5,094      | 10,183    |                    |
| Missouri.....                       | 58                  | 503,878       | 494,423           | 288,480          | 184,931     | 14,611             | 6,090                     |                                           |                   |                       | 311        | 9,455     |                    |
| Nebraska.....                       | 25                  | 218,589       | 214,497           | 132,144          | 74,853      | 7,500              |                           |                                           |                   |                       |            | 4,092     |                    |
| New Hampshire.....                  | 4                   | 22,287        | 21,652            | 15,168           | 6,484       |                    |                           |                                           |                   |                       |            | 635       |                    |
| New Jersey.....                     | 7                   | 70,069        | 69,673            | 40,225           | 25,891      | 1,057              | 2,500                     |                                           |                   |                       |            | 396       |                    |
| New York.....                       | 47                  | 448,462       | 438,840           | 225,170          | 202,168     | 10,903             |                           |                                           | 57                | 92                    | 450        | 9,622     |                    |
| North Carolina.....                 | 36                  | 313,440       | 307,797           | 201,663          | 94,350      | 11,634             |                           |                                           | 70                |                       | 80         | 5,643     |                    |
| North Dakota.....                   | 8                   | 76,742        | 69,974            | 50,660           | 17,912      | 1,384              |                           |                                           |                   | 18                    |            | 6,768     |                    |
| Ohio.....                           | 105                 | 1,135,279     | 1,106,915         | 551,749          | 531,618     | 19,470             |                           |                                           | 1,375             |                       | 2,703      | 28,364    |                    |
| Oklahoma.....                       | 14                  | 86,371        | 84,801            | 56,650           | 26,912      | 780                |                           |                                           |                   |                       | 459        | 1,570     |                    |
| Oregon.....                         | 11                  | 41,943        | 40,563            | 32,038           | 8,281       | 33                 |                           |                                           | 146               |                       | 65         | 1,380     |                    |
| Pennsylvania.....                   | 45                  | 660,151       | 653,656           | 202,157          | 433,668     | 17,761             |                           |                                           | 10                | 60                    |            | 6,495     |                    |
| South Carolina.....                 | 17                  | 147,526       | 132,667           | 77,907           | 50,328      | 3,785              |                           |                                           | 647               |                       |            | 14,859    |                    |
| South Dakota.....                   | 8                   | 73,915        | 71,982            | 47,711           | 23,491      | 780                |                           |                                           |                   |                       |            | 1,933     |                    |
| Tennessee.....                      | 28                  | 287,540       | 274,828           | 109,944          | 144,418     | 19,766             |                           | 700                                       |                   |                       |            | 12,712    |                    |
| Texas.....                          | 9                   | 207,234       | 207,234           | 111,690          | 80,063      | 14,844             |                           |                                           |                   |                       | 617        |           |                    |
| Utah.....                           | 9                   | 57,134        | 57,026            | 40,659           | 9,668       | 6,519              |                           | 180                                       |                   |                       |            | 108       |                    |
| Vermont.....                        | 13                  | 109,418       | 103,916           | 64,095           | 30,306      | 7,216              |                           | 950                                       |                   |                       | 1,349      | 5,502     |                    |
| Virginia.....                       | 14                  | 137,573       | 134,618           | 69,816           | 49,821      | 14,350             |                           |                                           | 100               |                       | 531        | 2,956     |                    |
| Washington.....                     | 6                   | 535,662       | 528,188           | 391,389          | 113,096     | 22,044             |                           | 1,659                                     |                   |                       |            | 7,474     |                    |
| West Virginia.....                  | 5                   | 54,735        | 54,695            | 6,838            | 47,457      | 400                |                           |                                           |                   |                       |            | 40        |                    |
| Wisconsin.....                      | 64                  | 378,730       | 353,517           | 239,681          | 108,744     | 4,856              |                           |                                           | 89                |                       | 147        | 25,213    |                    |
| All other states <sup>1</sup> ..... | 5                   | 75,309        | 74,904            | 52,441           | 21,643      | 760                |                           |                                           | 60                |                       |            | 406       |                    |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.



## GENERAL TABLES.

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TABLE 143.—MUNICIPAL CENTRAL ELECTRIC STATIONS—NUMBER OF SALARIED EMPLOYEES AND TOTAL SALARIES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | TOTAL.  |           | GENERAL MANAGERS, SUPERINTENDENTS, ETC. |           | CLERKS AND BOOK-KEEPERS. |           |
|-------------------------------------|---------------------|---------|-----------|-----------------------------------------|-----------|--------------------------|-----------|
|                                     |                     | Number. | Salaries. | Number.                                 | Salaries. | Number.                  | Salaries. |
| United States.....                  | 1,252               | 1,615   | \$994,832 | 1,069                                   | \$814,929 | 526                      | \$179,903 |
| Alabama.....                        | 28                  | 27      | 17,915    | 25                                      | 17,705    | 2                        | 210       |
| Arkansas.....                       | 13                  | 15      | 11,600    | 11                                      | 9,530     | 4                        | 2,070     |
| California.....                     | 14                  | 27      | 21,206    | 13                                      | 14,655    | 14                       | 6,553     |
| Colorado.....                       | 7                   | 9       | 5,630     | 5                                       | 4,250     | 4                        | 1,380     |
| Connecticut.....                    | 5                   | 10      | 9,010     | 5                                       | 6,270     | 5                        | 2,740     |
| Delaware.....                       | 6                   | 12      | 4,929     | 10                                      | 4,149     | 2                        | 780       |
| Florida.....                        | 13                  | 26      | 21,550    | 12                                      | 11,620    | 14                       | 9,930     |
| Georgia.....                        | 59                  | 78      | 50,775    | 64                                      | 46,775    | 14                       | 4,000     |
| Illinois.....                       | 112                 | 73      | 52,623    | 54                                      | 45,480    | 19                       | 7,143     |
| Indiana.....                        | 68                  | 93      | 55,309    | 68                                      | 46,741    | 25                       | 8,568     |
| Iowa.....                           | 51                  | 53      | 30,170    | 33                                      | 25,728    | 20                       | 4,442     |
| Kansas.....                         | 32                  | 43      | 22,165    | 29                                      | 19,826    | 14                       | 2,339     |
| Kentucky.....                       | 14                  | 16      | 11,300    | 11                                      | 9,960     | 5                        | 1,320     |
| Louisiana.....                      | 21                  | 32      | 23,644    | 21                                      | 20,580    | 11                       | 3,064     |
| Maine.....                          | 4                   | 6       | 3,082     | 6                                       | 3,082     |                          |           |
| Maryland.....                       | 8                   | 6       | 2,970     | 3                                       | 2,580     | 3                        | 390       |
| Massachusetts.....                  | 24                  | 60      | 40,248    | 36                                      | 29,437    | 24                       | 10,811    |
| Michigan.....                       | 104                 | 176     | 100,823   | 104                                     | 81,735    | 72                       | 19,068    |
| Minnesota.....                      | 92                  | 97      | 74,905    | 67                                      | 63,541    | 30                       | 11,364    |
| Mississippi.....                    | 39                  | 56      | 34,878    | 40                                      | 29,329    | 16                       | 5,549     |
| Missouri.....                       | 58                  | 59      | 37,363    | 41                                      | 33,150    | 18                       | 4,213     |
| Nebraska.....                       | 25                  | 23      | 13,554    | 15                                      | 11,930    | 8                        | 1,624     |
| New Hampshire.....                  | 4                   | 5       | 2,650     | 2                                       | 2,300     | 3                        | 350       |
| New Jersey.....                     | 7                   | 7       | 4,050     | 3                                       | 2,540     | 4                        | 1,510     |
| New York.....                       | 47                  | 58      | 29,769    | 32                                      | 23,642    | 26                       | 6,127     |
| North Carolina.....                 | 36                  | 40      | 30,187    | 32                                      | 27,747    | 8                        | 2,440     |
| North Dakota.....                   | 8                   | 10      | 10,307    | 8                                       | 9,272     | 2                        | 1,035     |
| Ohio.....                           | 105                 | 206     | 75,305    | 134                                     | 56,606    | 72                       | 18,699    |
| Oklahoma.....                       | 14                  | 19      | 9,112     | 13                                      | 7,920     | 6                        | 1,192     |
| Oregon.....                         | 11                  | 6       | 2,995     | 5                                       | 2,795     | 1                        | 200       |
| Pennsylvania.....                   | 45                  | 45      | 28,437    | 32                                      | 23,314    | 13                       | 5,123     |
| South Carolina.....                 | 17                  | 21      | 15,000    | 17                                      | 13,280    | 4                        | 1,720     |
| South Dakota.....                   | 8                   | 7       | 7,540     | 7                                       | 7,540     |                          |           |
| Tennessee.....                      | 28                  | 35      | 21,783    | 30                                      | 20,851    | 5                        | 932       |
| Texas.....                          | 9                   | 17      | 13,042    | 8                                       | 6,540     | 9                        | 6,502     |
| Utah.....                           | 9                   | 9       | 7,173     | 7                                       | 6,033     | 2                        | 1,140     |
| Vermont.....                        | 13                  | 20      | 9,061     | 16                                      | 8,328     | 4                        | 733       |
| Virginia.....                       | 14                  | 15      | 7,135     | 11                                      | 6,470     | 4                        | 665       |
| Washington.....                     | 6                   | 31      | 34,455    | 11                                      | 14,765    | 20                       | 19,690    |
| West Virginia.....                  | 5                   | 4       | 1,720     | 2                                       | 1,360     | 2                        | 360       |
| Wisconsin.....                      | 64                  | 54      | 31,534    | 40                                      | 29,003    | 14                       | 2,531     |
| All other states <sup>1</sup> ..... | 5                   | 9       | 7,926     | 6                                       | 6,550     | 3                        | 1,376     |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 144.—MUNICIPAL CENTRAL ELECTRIC STATIONS—AVERAGE NUMBER OF WAGE-EARNERS AND TOTAL WAGES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | TOTAL.          |             | FOREMEN.        |          | INSPECTORS.     |          | ENGINEERS.      |           | ALL OTHER EMPLOYEES (INCLUDING FIREMEN, DYNAMO AND SWITCHBOARD MEN, LINEMEN, MECHANICS, AND LAMP TRIMMERS). |             |
|-------------------------------------|---------------------|-----------------|-------------|-----------------|----------|-----------------|----------|-----------------|-----------|-------------------------------------------------------------------------------------------------------------|-------------|
|                                     |                     | Average number. | Wages.      | Average number. | Wages.   | Average number. | Wages.   | Average number. | Wages.    | Average number.                                                                                             | Wages.      |
| United States.....                  | 1,252               | 3,951           | \$2,490,183 | 90              | \$81,446 | 34              | \$28,632 | 1,411           | \$969,147 | 2,416                                                                                                       | \$1,410,958 |
| Alabama.....                        | 28                  | 67              | 25,055      | 1               | 1,000    | 1               | 480      | 27              | 11,125    | 40                                                                                                          | 13,930      |
| Arkansas.....                       | 13                  | 31              | 19,750      | 3               | 3,436    |                 |          | 14              | 9,640     | 15                                                                                                          | 8,630       |
| California.....                     | 14                  | 58              | 42,204      |                 |          |                 |          | 19              | 16,547    | 36                                                                                                          | 22,221      |
| Colorado.....                       | 7                   | 10              | 6,750       |                 |          |                 |          | 6               | 3,840     | 4                                                                                                           | 2,910       |
| Connecticut.....                    | 5                   | 32              | 24,093      | 1               | 884      | 1               | 728      | 10              | 9,198     | 20                                                                                                          | 13,283      |
| Delaware.....                       | 6                   | 15              | 7,886       |                 |          |                 |          | 8               | 4,940     | 7                                                                                                           | 2,946       |
| Florida.....                        | 13                  | 104             | 57,019      | 1               | 1,200    | 0               | 4,387    | 20              | 13,182    | 77                                                                                                          | 38,250      |
| Georgia.....                        | 59                  | 137             | 60,293      | 4               | 2,380    |                 |          | 43              | 23,181    | 90                                                                                                          | 34,732      |
| Illinois.....                       | 112                 | 475             | 393,226     | 14              | 14,055   | 2               | 2,280    | 137             | 111,961   | 322                                                                                                         | 264,930     |
| Indiana.....                        | 08                  | 239             | 141,912     | 3               | 2,630    | 3               | 2,160    | 89              | 57,632    | 144                                                                                                         | 79,490      |
| Iowa.....                           | 51                  | 113             | 69,113      | 2               | 1,510    |                 |          | 61              | 41,195    | 50                                                                                                          | 26,408      |
| Kansas.....                         | 32                  | 89              | 45,700      | 2               | 1,080    |                 |          | 44              | 26,136    | 43                                                                                                          | 18,484      |
| Kentucky.....                       | 14                  | 48              | 28,530      | 1               | 900      |                 |          | 18              | 12,290    | 29                                                                                                          | 15,340      |
| Louisiana.....                      | 21                  | 65              | 30,383      |                 |          |                 |          | 25              | 15,689    | 40                                                                                                          | 14,694      |
| Maine.....                          | 4                   | 23              | 16,468      | 1               | 300      |                 |          | 3               | 2,616     | 19                                                                                                          | 13,552      |
| Maryland.....                       | 8                   | 37              | 24,956      |                 |          |                 |          | 11              | 8,883     | 26                                                                                                          | 16,073      |
| Massachusetts.....                  | 24                  | 164             | 129,145     | 6               | 6,242    | 3               | 2,707    | 51              | 46,607    | 104                                                                                                         | 73,589      |
| Michigan.....                       | 104                 | 398             | 218,310     | 8               | 4,637    | 2               | 2,250    | 138             | 81,943    | 250                                                                                                         | 129,480     |
| Minnesota.....                      | 92                  | 178             | 105,509     | 2               | 1,440    |                 |          | 96              | 63,839    | 80                                                                                                          | 40,230      |
| Mississippi.....                    | 39                  | 105             | 45,899      | 3               | 2,340    |                 |          | 42              | 21,022    | 60                                                                                                          | 22,537      |
| Missouri.....                       | 58                  | 127             | 79,205      | 5               | 4,620    | 1               | 960      | 51              | 36,513    | 70                                                                                                          | 37,112      |
| Nebraska.....                       | 25                  | 50              | 31,321      |                 |          |                 |          | 22              | 15,014    | 28                                                                                                          | 16,307      |
| New Hampshire.....                  | 4                   | 5               | 3,010       |                 |          |                 |          |                 |           | 5                                                                                                           | 3,010       |
| New Jersey.....                     | 7                   | 22              | 11,796      | 1               | 832      | 1               | 624      | 7               | 4,152     | 13                                                                                                          | 6,188       |
| New York.....                       | 47                  | 158             | 97,064      | 4               | 3,469    |                 |          | 55              | 35,835    | 99                                                                                                          | 57,760      |
| North Carolina.....                 | 36                  | 91              | 41,867      | 3               | 2,250    |                 |          | 28              | 14,691    | 60                                                                                                          | 24,928      |
| North Dakota.....                   | 8                   | 16              | 12,434      |                 |          |                 |          | 9               | 7,766     | 7                                                                                                           | 4,668       |
| Ohio.....                           | 106                 | 337             | 219,656     | 8               | 7,615    | 3               | 2,235    | 141             | 106,316   | 185                                                                                                         | 103,490     |
| Oklahoma.....                       | 14                  | 31              | 17,834      |                 |          |                 |          | 18              | 11,734    | 13                                                                                                          | 6,100       |
| Oregon.....                         | 11                  | 15              | 8,008       |                 |          |                 |          | 8               | 5,215     | 7                                                                                                           | 2,798       |
| Pennsylvania.....                   | 45                  | 167             | 125,836     | 5               | 5,516    | 4               | 3,141    | 53              | 42,249    | 105                                                                                                         | 74,930      |
| South Carolina.....                 | 17                  | 49              | 21,062      |                 |          |                 |          | 16              | 9,640     | 33                                                                                                          | 11,412      |
| South Dakota.....                   | 8                   | 18              | 11,000      | 1               | 330      |                 |          | 8               | 5,720     | 9                                                                                                           | 4,850       |
| Tennessee.....                      | 28                  | 84              | 45,730      |                 |          |                 |          | 29              | 17,705    | 55                                                                                                          | 28,025      |
| Texas.....                          | 9                   | 45              | 29,846      | 1               | 1,200    | 1               | 900      | 15              | 10,566    | 28                                                                                                          | 17,180      |
| Utah.....                           | 9                   | 18              | 12,354      |                 |          |                 |          | 3               | 2,569     | 15                                                                                                          | 9,785       |
| Vermont.....                        | 13                  | 28              | 16,529      |                 |          |                 |          | 2               | 1,537     | 26                                                                                                          | 14,692      |
| Virginia.....                       | 14                  | 34              | 21,532      |                 |          | 2               | 1,540    | 13              | 9,760     | 19                                                                                                          | 10,242      |
| Washington.....                     | 6                   | 110             | 98,008      | 8               | 9,780    | 3               | 3,240    | 3               | 2,280     | 96                                                                                                          | 82,708      |
| West Virginia.....                  | 5                   | 29              | 15,830      | 1               | 720      |                 |          | 7               | 5,284     | 21                                                                                                          | 12,826      |
| Wisconsin.....                      | 64                  | 114             | 65,284      | 1               | 1,080    |                 |          | 56              | 38,725    | 57                                                                                                          | 25,479      |
| All other states <sup>1</sup> ..... | 5                   | 15              | 9,786       |                 |          | 1               | 1,000    | 5               | 4,120     | 9                                                                                                           | 4,666       |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

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## GENERAL TABLES.

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TABLE 145.—MUNICIPAL CENTRAL ELECTRIC STATIONS—ANALYSIS OF MISCELLANEOUS EXPENSES, BY STATES AND TERRITORIES: 1907.

| STATE OR TERRITORY.                 | Number of stations. | Total expenses. | Rent of stations, line-wire supports, conduits, etc. | Rent of offices. | Taxes.  | Injuries and damages. | Insurance. | Ordinary repairs of buildings and machinery. | All other expenses. |
|-------------------------------------|---------------------|-----------------|------------------------------------------------------|------------------|---------|-----------------------|------------|----------------------------------------------|---------------------|
| United States.....                  | 1,252               | \$714,486       | \$5,654                                              | \$10,721         | \$5,224 | \$32,468              | \$110,260  | \$314,006                                    | \$236,052           |
| Alabama.....                        | 28                  | 6,732           |                                                      | 168              |         |                       | 885        | 2,519                                        | 3,160               |
| Arkansas.....                       | 13                  | 5,681           |                                                      | 130              | 150     |                       | 1,069      | 2,561                                        | 1,771               |
| California.....                     | 14                  | 9,124           |                                                      |                  |         |                       | 1,578      | 2,452                                        | 5,094               |
| Colorado.....                       | 7                   | 1,890           | 96                                                   |                  |         |                       | 314        | 250                                          | 1,230               |
| Connecticut.....                    | 5                   | 11,967          |                                                      | 30               |         |                       | 1,958      | 6,527                                        | 3,452               |
| Delaware.....                       | 6                   | 4,484           |                                                      | 145              | 150     |                       | 326        | 2,322                                        | 1,532               |
| Florida.....                        | 13                  | 8,214           |                                                      | 46               | 117     |                       | 4,746      | 2,238                                        | 1,067               |
| Georgia.....                        | 59                  | 15,291          |                                                      | 243              |         | 662                   | 3,635      | 5,001                                        | 5,750               |
| Illinois.....                       | 112                 | 44,796          | 875                                                  | 133              |         | 2,700                 | 6,259      | 22,144                                       | 12,685              |
| Indiana.....                        | 68                  | 46,170          |                                                      | 1,241            | 508     | 25                    | 7,737      | 19,629                                       | 17,030              |
| Iowa.....                           | 51                  | 28,109          |                                                      | 168              |         | 1,830                 | 4,592      | 9,493                                        | 12,026              |
| Kansas.....                         | 32                  | 12,344          |                                                      | 270              |         |                       | 1,895      | 5,945                                        | 4,234               |
| Kentucky.....                       | 14                  | 8,847           | 333                                                  | 192              | 20      |                       | 1,737      | 3,123                                        | 3,442               |
| Louisiana.....                      | 21                  | 18,491          |                                                      |                  | 50      | 25                    | 1,775      | 14,781                                       | 1,880               |
| Maine.....                          | 4                   | 5,401           |                                                      |                  |         |                       | 483        | 2,602                                        | 2,316               |
| Maryland.....                       | 8                   | 5,814           |                                                      | 120              |         | 625                   | 576        | 3,506                                        | 987                 |
| Massachusetts.....                  | 24                  | 56,448          | 396                                                  | 628              | 6       |                       | 9,802      | 23,755                                       | 21,871              |
| Michigan.....                       | 104                 | 65,161          | 175                                                  | 676              | 127     | 2,992                 | 7,646      | 33,783                                       | 19,762              |
| Minnesota.....                      | 92                  | 43,636          | 189                                                  | 402              | 170     | 1,685                 | 8,659      | 24,187                                       | 8,344               |
| Mississippi.....                    | 39                  | 21,570          | 120                                                  | 65               |         | 11,100                | 3,003      | 4,006                                        | 3,186               |
| Missouri.....                       | 58                  | 36,004          |                                                      | 540              | 700     | 3,300                 | 5,708      | 14,330                                       | 11,426              |
| Nebraska.....                       | 25                  | 7,785           |                                                      | 256              | 160     |                       | 840        | 3,673                                        | 2,856               |
| New Hampshire.....                  | 4                   | 1,437           |                                                      | 98               |         |                       | 251        | 243                                          | 847                 |
| New Jersey.....                     | 7                   | 3,893           |                                                      | 540              | 53      |                       | 872        | 852                                          | 1,376               |
| New York.....                       | 47                  | 22,940          | 26                                                   | 208              | 414     |                       | 4,479      | 9,532                                        | 7,983               |
| North Carolina.....                 | 36                  | 14,715          |                                                      | 699              | 100     | 1,130                 | 2,319      | 4,516                                        | 5,951               |
| North Dakota.....                   | 8                   | 6,630           |                                                      | 225              | 200     |                       | 1,056      | 3,718                                        | 1,431               |
| Ohio.....                           | 105                 | 65,762          | 63                                                   | 670              |         | 3,315                 | 8,003      | 31,390                                       | 22,321              |
| Oklahoma.....                       | 14                  | 4,837           |                                                      | 172              |         | 40                    | 606        | 2,008                                        | 2,011               |
| Oregon.....                         | 11                  | 1,906           |                                                      |                  |         |                       | 241        | 665                                          | 1,000               |
| Pennsylvania.....                   | 45                  | 27,897          | 327                                                  | 18               | 403     | 15                    | 2,961      | 15,226                                       | 8,947               |
| South Carolina.....                 | 17                  | 4,380           |                                                      | 183              | 30      | 286                   | 1,083      | 1,588                                        | 1,210               |
| South Dakota.....                   | 8                   | 5,586           |                                                      |                  | 16      |                       | 421        | 1,516                                        | 3,633               |
| Tennessee.....                      | 28                  | 16,524          | 1,320                                                | 170              | 50      | 2,000                 | 1,872      | 6,566                                        | 4,547               |
| Texas.....                          | 9                   | 12,140          |                                                      | 600              |         | 308                   | 2,592      | 6,464                                        | 2,176               |
| Utah.....                           | 9                   | 4,740           |                                                      | 300              |         |                       | 106        | 3,372                                        | 963                 |
| Vermont.....                        | 13                  | 15,950          | 612                                                  | 411              | 650     |                       | 2,165      | 4,018                                        | 8,094               |
| Virginia.....                       | 14                  | 4,237           | 120                                                  | 280              | 920     |                       | 1,046      | 1,258                                        | 614                 |
| Washington.....                     | 6                   | 11,740          | 1,000                                                | 500              |         |                       | 406        | 820                                          | 9,014               |
| West Virginia.....                  | 5                   | 894             |                                                      |                  |         |                       | 102        | 467                                          | 325                 |
| Wisconsin.....                      | 64                  | 18,272          | 12                                                   | 18               | 46      | 80                    | 3,801      | 7,905                                        | 6,510               |
| All other states <sup>1</sup> ..... | 5                   | 6,247           |                                                      | 180              | 175     | 350                   | 666        | 2,858                                        | 2,018               |

<sup>1</sup> Includes states having less than 3 stations, in order that the operations of individual stations may not be disclosed. These stations are distributed as follows: Idaho, 2; Montana, 2; Rhode Island, 1.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 146.—CENTRAL ELECTRIC LIGHT AND POWER STATIONS OPERATED BY STREET-RAILWAY COMPANIES—ANALYSIS OF ARC-LIGHTING SERVICE, BY STATES: 1907<sup>1</sup> AND 1902.

[Separate reports for these stations could not be secured, hence the statistics for them have been included with those for electric railways.]

| STATE OR TERRITORY.                 | Census.      | Number of companies. | ARC LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |                |                  |                 |                 |                 |                 |                 |                |                      |                 |          |                 |                         |     |                |  |
|-------------------------------------|--------------|----------------------|-------------------------------------------------|----------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------------|-----------------|----------|-----------------|-------------------------|-----|----------------|--|
|                                     |              |                      | Aggregate.                                      | Total.         |                  |                 |                 | Direct-current. |                 |                 |                | Alternating-current. |                 |          |                 | All other. <sup>1</sup> |     |                |  |
|                                     |              |                      |                                                 | Commercial.    |                  | Public.         |                 | Commercial.     |                 | Public.         |                | Commercial.          |                 | Public.  |                 | Commercial.             |     | Public (open). |  |
|                                     |              |                      |                                                 | Open.          | In-closed.       | Open.           | In-closed.      | Open.           | In-closed.      | Open.           | In-closed.     | Open.                | In-closed.      | Open.    | In-closed.      |                         |     |                |  |
|                                     |              |                      |                                                 |                |                  |                 |                 |                 |                 |                 |                |                      |                 |          |                 |                         |     |                |  |
| Total.....                          | 1907<br>1902 | 177<br>118           | 80,102<br>33,863                                | 4,491<br>2,582 | 46,153<br>13,603 | 4,644<br>10,868 | 24,784<br>6,810 | 882<br>2,413    | 11,013<br>6,459 | 4,504<br>10,495 | 6,220<br>1,072 | 3,609<br>1           | 35,170<br>7,069 | 140<br>8 | 18,564<br>5,738 | 168<br>75               | 365 |                |  |
| Alabama.....                        | 1907<br>1902 | 5<br>4               | 2,633<br>1,291                                  | 449            | 1,759<br>442     | 325             | 874<br>75       | 449             | 1,015<br>388    | 325             |                |                      | 744<br>54       |          | 874<br>75       |                         |     |                |  |
| Arkansas <sup>2</sup> .....         | 1907         | 5                    | 1,527                                           |                | 1,368            |                 | 150             |                 | 350             |                 |                |                      | 1,018           |          | 150             |                         |     |                |  |
| Florida.....                        | 1907<br>1902 | 5<br>3               | 745<br>222                                      | 109<br>103     | 287<br>55        |                 | 349<br>64       | 109<br>103      |                 |                 |                |                      | 287<br>55       |          | 349<br>64       |                         |     |                |  |
| Georgia.....                        | 1907<br>1902 | 7<br>7               | 6,172<br>4,347                                  | 164<br>238     | 3,308<br>2,092   | 727<br>761      | 1,973<br>1,256  | 161<br>238      | 1,655<br>1,294  | 707<br>761      | 239<br>238     | 3<br>3               | 1,653<br>798    | 20       | 1,734<br>1,018  |                         |     |                |  |
| Illinois.....                       | 1907<br>1902 | 12<br>4              | 4,099<br>817                                    | 103<br>235     | 2,447<br>328     | 278             | 1,271<br>254    |                 | 1,141<br>295    | 278             | 640<br>254     | 103                  | 1,306<br>33     |          | 631             |                         |     |                |  |
| Indiana <sup>3</sup> .....          | 1907         | 7                    | 2,133                                           |                | 1,196            | 74              | 863             |                 |                 | 74              | 661            |                      | 1,196           |          | 202             |                         |     |                |  |
| Iowa.....                           | 1907<br>1902 | 11<br>8              | 2,886<br>1,603                                  | 38<br>133      | 1,219<br>388     | 234<br>812      | 1,395<br>270    | 30<br>133       | 140<br>84       | 234<br>812      | 51<br>40       | 8                    | 1,079<br>304    |          | 1,344<br>230    |                         |     |                |  |
| Kansas <sup>4</sup> .....           | 1907         | 3                    | 483                                             | 39             | 53               | 93              | 298             | 39              | 5               | 93              |                |                      | 48              |          | 298             |                         |     |                |  |
| Maine.....                          | 1907<br>1902 | 3<br>3               | 658<br>431                                      |                | 454<br>230       | 104<br>115      | 100<br>61       |                 | 101<br>115      | 104<br>115      | 52<br>30       |                      | 353<br>115      |          | 48<br>31        |                         |     |                |  |
| Michigan.....                       | 1907<br>1902 | 7<br>6               | 1,308<br>860                                    |                | 590<br>286       | 89<br>352       | 629<br>201      |                 |                 | 89<br>352       |                |                      | 590<br>250      |          | 629<br>201      |                         |     |                |  |
| Mississippi.....                    | 1907<br>1902 | 6<br>3               | 899<br>477                                      |                | 254<br>112       |                 | 645<br>233      |                 |                 |                 |                |                      | 254<br>112      |          | 645<br>233      |                         |     |                |  |
| Missouri.....                       | 1907<br>1902 | 4<br>3               | 1,079<br>203                                    |                | 890<br>5         |                 | 189<br>50       |                 |                 | 111             |                |                      | 890<br>5        |          | 189<br>50       |                         |     |                |  |
| New York.....                       | 1907<br>1902 | 11<br>10             | 2,566<br>2,594                                  | 759<br>56      | 306<br>1,070     | 163<br>964      | 1,338<br>504    |                 | 31<br>65        | 163<br>904      | 400            | 759<br>1             | 275<br>1,005    |          | 938<br>504      |                         |     |                |  |
| North Carolina.....                 | 1907<br>1902 | 8<br>5               | 1,821<br>613                                    |                | 837<br>174       | 194<br>325      | 790<br>102      |                 |                 | 194<br>325      |                |                      | 837<br>174      |          | 790<br>102      |                         |     |                |  |
| Ohio.....                           | 1907<br>1902 | 20<br>11             | 7,152<br>2,933                                  |                | 2,659<br>518     | 359<br>1,838    | 4,134<br>553    |                 | 1,298<br>90     | 249<br>1,838    | 2,555          |                      | 1,361<br>353    | 110      | 1,579<br>553    |                         | 75  |                |  |
| Pennsylvania <sup>5</sup> .....     | 1907         | 7                    | 619                                             |                | 338              | 14              | 267             |                 | 12              | 14              |                |                      | 326             |          | 267             |                         |     |                |  |
| South Carolina.....                 | 1907<br>1902 | 3<br>3               | 1,114<br>693                                    |                | 432<br>236       |                 | 682<br>457      |                 |                 |                 | 275<br>198     |                      | 432<br>199      |          | 407<br>259      |                         |     |                |  |
| Tennessee <sup>6</sup> .....        | 1907         | 3                    | 3,914                                           | 2,765          | 809              |                 | 340             | 02              |                 |                 | 2,703          |                      | 809             |          | 340             |                         |     |                |  |
| Texas <sup>7</sup> .....            | 1907         | 4                    | 540                                             | 7              | 299              |                 | 234             |                 | 12              |                 |                | 7                    | 287             |          | 234             |                         |     |                |  |
| Virginia.....                       | 1907<br>1902 | 10<br>7              | 5,956<br>2,983                                  | 42<br>219      | 3,305<br>1,710   | 483<br>757      | 2,126<br>297    | 42<br>219       | 1,913<br>933    | 483<br>757      | 270<br>100     |                      | 1,392<br>777    |          | 1,856<br>197    |                         |     |                |  |
| Washington.....                     | 1907<br>1902 | 6<br>4               | 3,340<br>1,854                                  |                | 2,932<br>1,416   |                 | 408<br>303      |                 | 1,474<br>1,263  |                 |                |                      | 1,458<br>153    |          | 408<br>182      |                         |     |                |  |
| West Virginia.....                  | 1907<br>1902 | 7<br>3               | 1,259<br>572                                    |                | 325<br>70        |                 | 934<br>427      |                 |                 | 75              | 34             |                      | 325<br>70       |          | 900<br>427      |                         |     |                |  |
| Wisconsin.....                      | 1907<br>1902 | 7<br>9               | 5,391<br>4,715                                  | 420<br>387     | 1,773<br>1,778   | 1,348<br>1,871  | 1,850<br>679    | 420<br>387      | 1,057<br>1,277  | 1,348<br>1,871  | 15<br>91       |                      | 716<br>501      |          | 1,835<br>588    |                         |     |                |  |
| All other states <sup>8</sup> ..... | 1907<br>1902 | 16<br>25             | 21,808<br>6,646                                 | 45<br>518      | 18,343<br>2,693  | 484<br>2,411    | 2,936<br>1,024  | 19<br>350       | 809<br>582      | 474<br>2,038    | 1,028          | 26                   | 17,534<br>2,111 | 10<br>8  | 1,908<br>1,024  | 168                     | 365 |                |  |

<sup>1</sup> Two companies in one of the outlying districts (Porto Rico) reported light plants, which have been excluded from this table.<sup>2</sup> Not reported in 1907.<sup>3</sup> Included in "All other states" in 1902.<sup>4</sup> No report for 1902.<sup>5</sup> Includes states having less than 3 companies, in order that the operations of individual companies may not be disclosed. These companies are distributed as follows: In 1907—California, 1; Colorado, 2; Connecticut, 1; Kentucky, 2; Louisiana, 2; Maryland, 1; Massachusetts, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Mexico, 1; Utah, 1; In 1902—Arkansas, 2; California, 2; Colorado, 2; Connecticut, 2; Delaware, 1; Indiana, 2; Kansas, 1; Kentucky, 2; Louisiana, 1; Maryland, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Jersey, 2; Oregon, 1; Tennessee, 2.

**TABLE 147.—CENTRAL ELECTRIC LIGHT AND POWER STATIONS OPERATED BY STREET-RAILWAY COMPANIES—ANALYSIS OF INCANDESCENT AND OTHER VARIETIES OF LIGHTING SERVICE AS WELL AS MOTOR SERVICE AND NUMBER OF METERS, BY STATES: 1907<sup>1</sup> AND 1902.**

[Separate reports for these stations could not be secured, hence the statistics for them have been included with those for electric railways.]

| STATE OR TERRITORY.                 | Cen-sus.     | Num-ber of com-panies. | INCANDESCENT LIGHTING—NUMBER OF LAMPS WIRED FOR SERVICE. |                        |                  |                        |                  |                   |                |                   |                |        | OTHER ELECTRIC LIGHT-ING <sup>2</sup> (NERNST, VAC-UUM, VAPOR, ETC.)—NUMBER OF LAMPS WIRED FOR SERVICE. |         |                    | STATIONARY-MOTOR SERVICE.       |                   | Num-ber of meters on con-sump-tion cir-cuits. |
|-------------------------------------|--------------|------------------------|----------------------------------------------------------|------------------------|------------------|------------------------|------------------|-------------------|----------------|-------------------|----------------|--------|---------------------------------------------------------------------------------------------------------|---------|--------------------|---------------------------------|-------------------|-----------------------------------------------|
|                                     |              |                        | Aggre-gate.                                              | Total.                 |                  | 16-candlepower.        |                  | 32-candlepower.   |                | All other.        |                | Total. | Com-mercial.                                                                                            | Public. | Num-ber of motors. | Total capac-ity in horse-power. |                   |                                               |
|                                     |              |                        |                                                          | Com-mercial.           | Public.          | Com-mercial.           | Public.          | Com-mercial.      | Public.        | Com-mercial.      | Public.        |        |                                                                                                         |         |                    |                                 |                   |                                               |
| Total.....                          | 1907<br>1902 | 177<br>118             | 4,545,839<br>1,442,685                                   | 4,487,681<br>1,423,659 | 58,158<br>19,026 | 3,871,786<br>1,313,303 | 48,451<br>13,065 | 217,228<br>31,597 | 2,264<br>1,119 | 398,667<br>78,759 | 7,443<br>4,842 | 28,641 | 28,267                                                                                                  | 374     | 20,468<br>10,049   | 158,923<br>35,688               | 213,886<br>56,601 |                                               |
| Alabama.....                        | 1907<br>1902 | 5<br>4                 | 151,108<br>50,704                                        | 151,003<br>50,045      | 105<br>659       | 150,648<br>47,705      | 105<br>659       | 355<br>2,203      | .....          | .....             | 137            | .....  | .....                                                                                                   | .....   | 989<br>648         | 4,923<br>936                    | 9,331<br>2,606    |                                               |
| Arkansas <sup>3</sup> .....         | 1907         | 5                      | 88,897                                                   | 88,404                 | 493              | 78,219                 | .....            | 1,362             | 131            | 8,823             | 362            | 1      | 1                                                                                                       | .....   | 898                | 2,420                           | 6,305             |                                               |
| Florida.....                        | 1907<br>1902 | 5<br>3                 | 83,066<br>19,872                                         | 81,790<br>19,541       | 1,276<br>331     | 81,165<br>19,408       | 1,235<br>323     | 250<br>127        | .....<br>8     | 375<br>6          | 41             | 71     | 71                                                                                                      | .....   | 580<br>137         | 2,624<br>714                    | 5,404<br>880      |                                               |
| Georgia.....                        | 1907<br>1902 | 7<br>7                 | 322,843<br>136,978                                       | 320,761<br>135,604     | 2,062<br>1,374   | 313,261<br>132,630     | 1,536<br>900     | 7,500<br>1,470    | .....<br>30    | .....<br>1,504    | 546<br>444     | 167    | 167                                                                                                     | .....   | 1,853<br>2,066     | 14,377<br>4,844                 | 12,572<br>5,121   |                                               |
| Illinois.....                       | 1907<br>1902 | 12<br>4                | 270,367<br>42,426                                        | 270,193<br>42,426      | 174              | 238,140<br>37,883      | 100              | 7,837<br>226      | 54             | 24,216<br>4,317   | 20             | 391    | 114                                                                                                     | 277     | 1,490<br>202       | 5,952<br>611                    | 10,862<br>1,475   |                                               |
| Indiana <sup>4</sup> .....          | 1907         | 7                      | 91,304                                                   | 91,178                 | 126              | 72,989                 | 106              | 4,473             | .....          | 13,716            | 20             | 80     | 80                                                                                                      | .....   | 473                | 2,123                           | 4,842             |                                               |
| Iowa.....                           | 1907<br>1902 | 11<br>8                | 150,693<br>62,284                                        | 150,289<br>61,924      | 404<br>360       | 114,592<br>57,610      | 245<br>60        | 6,620<br>1,830    | 159<br>50      | 29,077<br>2,484   | .....<br>250   | 2,638  | 2,832                                                                                                   | 6       | 947<br>549         | 5,408<br>1,479                  | 7,356<br>3,338    |                                               |
| Kansas <sup>5</sup> .....           | 1907         | 3                      | 36,000                                                   | 29,000                 | 7,000            | 5,200                  | 6,500            | 22,300            | 160            | 1,500             | 350            | 65     | 65                                                                                                      | .....   | 164                | 1,491                           | 1,787             |                                               |
| Maine.....                          | 1907<br>1902 | 3<br>3                 | 82,363<br>39,443                                         | 82,036<br>39,379       | 327<br>64        | 60,974<br>38,079       | 238              | 7,854<br>300      | 75<br>39       | 13,208<br>1,000   | 14<br>25       | .....  | .....                                                                                                   | .....   | 283<br>129         | 2,279<br>1,011                  | 2,353<br>1,139    |                                               |
| Michigan.....                       | 1907<br>1902 | 7<br>6                 | 103,462<br>43,389                                        | 100,902<br>41,169      | 2,560<br>2,220   | 92,740<br>36,577       | 2,371<br>2,130   | 2,550<br>1,134    | 85<br>90       | 5,612<br>3,458    | 104            | 202    | 202                                                                                                     | .....   | 527<br>136         | 3,277<br>700                    | 5,360<br>1,857    |                                               |
| Mississippi.....                    | 1907<br>1902 | 6<br>3                 | 66,240<br>12,887                                         | 65,620<br>11,890       | 620<br>997       | 58,920<br>11,290       | 405<br>997       | 5,000<br>100      | 215            | 1,700<br>500      | .....          | 204    | 148                                                                                                     | 56      | 151<br>295         | 1,065<br>196                    | 4,160<br>714      |                                               |
| Missouri.....                       | 1907<br>1902 | 4<br>3                 | 88,930<br>66,130                                         | 88,820<br>66,075       | 110<br>55        | 65,999<br>45,000       | 60<br>50         | 22,578<br>75      | .....<br>5     | 243<br>21,000     | 50             | 22     | 22                                                                                                      | .....   | 392<br>87          | 2,621<br>119                    | 3,966<br>1,563    |                                               |
| New York.....                       | 1907<br>1902 | 11<br>10               | 134,363<br>100,561                                       | 124,273<br>98,812      | 10,090<br>1,749  | 119,697<br>86,950      | 5,051<br>691     | 1,451<br>2,257    | 21<br>47       | 3,125<br>9,605    | 5,018<br>1,011 | .....  | .....                                                                                                   | .....   | 482<br>336         | 5,446<br>2,662                  | 5,434<br>6,217    |                                               |
| North Carolina.....                 | 1907<br>1902 | 8<br>5                 | 126,131<br>31,742                                        | 124,681<br>31,498      | 1,450<br>244     | 102,882<br>28,132      | 1,450<br>204     | 3,097<br>423      | .....<br>40    | 18,102<br>2,943   | .....          | 380    | 380                                                                                                     | .....   | 556<br>105         | 5,043<br>1,544                  | 6,562<br>1,273    |                                               |
| Ohio.....                           | 1907<br>1902 | 20<br>11               | 522,022<br>189,708                                       | 516,469<br>188,065     | 5,553<br>1,643   | 386,692<br>186,683     | 5,198<br>1,613   | 32,705<br>682     | 150<br>20      | 97,072<br>700     | 205<br>10      | 1,335  | 1,300                                                                                                   | 35      | 2,275<br>513       | 17,613<br>3,589                 | 19,211<br>5,813   |                                               |
| Pennsylvania <sup>6</sup> .....     | 1907         | 7                      | 31,331                                                   | 31,057                 | 274              | 25,968                 | 150              | 564               | 116            | 4,505             | 8              | 169    | 169                                                                                                     | .....   | 70                 | 451                             | 1,251             |                                               |
| South Carolina.....                 | 1907<br>1902 | 3<br>3                 | 115,767<br>24,225                                        | 110,370<br>24,117      | 5,397<br>108     | 101,370<br>23,517      | 5,391<br>100     | 6,000<br>600      | 6              | 3,000             | .....<br>8     | .....  | .....                                                                                                   | .....   | 339<br>689         | 7,598<br>618                    | 3,629<br>1,270    |                                               |
| Tennessee <sup>7</sup> .....        | 1907         | 3                      | 191,491                                                  | 191,491                | .....            | 177,439                | .....            | 3,759             | .....          | 10,293            | .....          | 31     | 31                                                                                                      | .....   | 801                | 10,083                          | 9,288             |                                               |
| Texas <sup>8</sup> .....            | 1907         | 4                      | 82,656                                                   | 80,811                 | 1,845            | 80,811                 | 1,845            | .....             | .....          | .....             | .....          | 9,251  | 9,251                                                                                                   | .....   | 275                | 3,349                           | 5,729             |                                               |
| Virginia.....                       | 1907<br>1902 | 10<br>7                | 373,928<br>65,148                                        | 372,713<br>64,815      | 1,215<br>333     | 284,321<br>52,595      | 849<br>328       | 7,030<br>2,224    | 230<br>5       | 81,362<br>9,996   | 136            | 22     | 22                                                                                                      | .....   | 894<br>1,960       | 15,416<br>1,467                 | 15,553<br>3,100   |                                               |
| Washington.....                     | 1907<br>1902 | 6<br>4                 | 293,672<br>93,247                                        | 292,068<br>90,483      | 1,604<br>2,764   | 276,518<br>70,667      | 1,564<br>205     | 1,635<br>10,828   | 40<br>35       | 13,915<br>8,988   | .....<br>2,524 | 566    | 566                                                                                                     | .....   | 1,614<br>587       | 12,861<br>3,720                 | 22,181<br>4,838   |                                               |
| West Virginia.....                  | 1907<br>1902 | 7<br>3                 | 88,967<br>23,294                                         | 78,571<br>23,294       | 10,396           | 68,662<br>20,984       | 10,005           | 4,459<br>1,647    | 391            | 5,450<br>663      | .....          | 187    | 187                                                                                                     | .....   | 153<br>28          | 857<br>121                      | 4,171<br>770      |                                               |
| Wisconsin.....                      | 1907<br>1902 | 7<br>9                 | 382,724<br>180,073                                       | 382,278<br>179,611     | 446<br>462       | 381,278<br>170,305     | 396<br>337       | .....<br>3,646    | 50<br>125      | 1,000<br>5,660    | .....          | 11,108 | 11,108                                                                                                  | .....   | 1,914<br>87        | 13,121<br>3,711                 | 12,708<br>5,403   |                                               |
| All other states <sup>9</sup> ..... | 1907<br>1902 | 16<br>25               | 667,514<br>260,574                                       | 662,903<br>254,911     | 4,611<br>5,663   | 533,281<br>247,288     | 3,651<br>4,468   | 67,249<br>1,825   | 391<br>625     | 62,373<br>5,798   | 569<br>570     | 1,551  | 1,551                                                                                                   | .....   | 2,348<br>1,495     | 18,525<br>7,644                 | 33,871<br>9,234   |                                               |

<sup>1</sup>Two companies in one of the outlying districts (Porto Rico) reported light plants, which have been excluded from this table.

<sup>2</sup>Not reported in 1902.

<sup>3</sup>Included in "All other states" in 1902.

<sup>4</sup>No report for 1902.

<sup>5</sup>Includes states having less than 3 companies, in order that the operations of individual companies may not be disclosed. These companies are distributed as follows: In 1907—California, 1; Colorado, 2; Connecticut, 1; Kentucky, 2; Louisiana, 2; Maryland, 1; Massachusetts, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Mexico, 1; Utah, 1; In 1902—Arkansas, 2; California, 2; Colorado, 2; Connecticut, 2; Delaware, 1; Indiana, 2; Kansas, 1; Kentucky, 2; Louisiana, 1; Maryland, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Jersey, 2; Oregon, 1; Tennessee, 2.

## CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

TABLE 148.—CENTRAL ELECTRIC LIGHT AND POWER STATIONS OPERATED BY STREET-RAILWAY COMPANIES—INCOME, BY STATES: 1907<sup>1</sup> AND 1902.

[Separate reports for these stations could not be secured, hence the statistics for them have been included with those for electric railways.]

| STATE OR TERRITORY.                 | Census. | Number of companies. | INCOME.       |                       |              |                    |                             | From all other sources. |
|-------------------------------------|---------|----------------------|---------------|-----------------------|--------------|--------------------|-----------------------------|-------------------------|
|                                     |         |                      | Gross income. | From sale of current. |              |                    |                             |                         |
|                                     |         |                      |               | Total.                | Lighting.    | Stationary motors. | All other electric service. |                         |
| Total.....                          | 1907    | 177                  | \$17,291,824  | \$16,576,555          | \$13,273,295 | \$2,685,013        | \$618,247                   | \$715,269               |
|                                     | 1902    | 118                  | 6,469,726     | 6,271,815             | 5,492,669    | 768,040            | 11,106                      | 197,911                 |
| Alabama.....                        | 1907    | 5                    | 671,425       | 671,425               | 586,629      | 84,796             |                             |                         |
|                                     | 1902    | 4                    | 318,660       | 317,011               | 290,166      | 26,345             | 500                         | 1,649                   |
| Arkansas <sup>2</sup> .....         | 1907    | 5                    | 383,631       | 383,225               | 340,524      | 39,529             | 3,172                       | 406                     |
| Florida.....                        | 1907    | 5                    | 380,022       | 375,691               | 326,207      | 49,427             | 57                          | 4,331                   |
|                                     | 1902    | 3                    | 110,209       | 110,209               | 96,557       | 13,652             |                             |                         |
| Georgia.....                        | 1907    | 7                    | 1,498,822     | 1,484,966             | 1,169,744    | 284,938            | 30,284                      | 13,856                  |
|                                     | 1902    | 7                    | 722,728       | 713,700               | 594,207      | 119,260            | 233                         | 9,028                   |
| Illinois.....                       | 1907    | 12                   | 943,859       | 829,667               | 685,299      | 106,664            | 37,704                      | 114,192                 |
|                                     | 1902    | 4                    | 161,070       | 151,867               | 125,078      | 23,038             | 3,751                       | 9,208                   |
| Indiana <sup>2</sup> .....          | 1907    | 7                    | 331,342       | 315,220               | 270,510      | 43,710             | 1,000                       | 16,122                  |
| Iowa.....                           | 1907    | 11                   | 594,884       | 540,966               | 428,768      | 103,091            | 9,107                       | 53,898                  |
|                                     | 1902    | 8                    | 291,142       | 270,423               | 230,380      | 40,043             |                             | 20,719                  |
| Kansas <sup>2</sup> .....           | 1907    | 3                    | 146,669       | 131,954               | 104,850      | 27,074             | 30                          | 14,715                  |
| Maine.....                          | 1907    | 3                    | 188,456       | 187,237               | 155,637      | 29,618             | 1,982                       | 1,219                   |
|                                     | 1902    | 3                    | 101,892       | 94,736                | 79,595       | 15,141             |                             | 7,156                   |
| Michigan.....                       | 1907    | 7                    | 345,813       | 321,768               | 256,329      | 30,778             | 34,661                      | 24,045                  |
|                                     | 1902    | 6                    | 162,549       | 157,920               | 148,580      | 9,340              |                             | 4,629                   |
| Mississippi.....                    | 1907    | 6                    | 317,855       | 308,053               | 292,353      | 15,400             | 300                         | 9,802                   |
|                                     | 1902    | 3                    | 98,838        | 98,838                | 89,779       | 8,982              | 77                          |                         |
| Missouri.....                       | 1907    | 4                    | 274,929       | 240,957               | 195,105      | 45,852             |                             | 33,972                  |
|                                     | 1902    | 3                    | 163,406       | 151,004               | 148,764      | 2,240              |                             | 12,402                  |
| New York.....                       | 1907    | 11                   | 621,856       | 612,683               | 532,373      | 74,058             | 6,252                       | 9,173                   |
|                                     | 1902    | 10                   | 413,782       | 412,403               | 384,231      | 28,172             |                             | 1,379                   |
| North Carolina.....                 | 1907    | 8                    | 491,081       | 473,651               | 389,632      | 81,282             | 2,737                       | 17,430                  |
|                                     | 1902    | 5                    | 155,770       | 155,770               | 119,405      | 36,365             |                             |                         |
| Ohio.....                           | 1907    | 20                   | 1,597,195     | 1,461,559             | 1,184,555    | 210,712            | 66,292                      | 135,636                 |
|                                     | 1902    | 11                   | 587,967       | 574,929               | 521,547      | 53,382             |                             | 13,088                  |
| Pennsylvania <sup>2</sup> .....     | 1907    | 7                    | 104,703       | 102,878               | 93,446       | 9,422              | 10                          | 1,825                   |
| South Carolina.....                 | 1907    | 3                    | 438,911       | 437,483               | 272,293      | 164,156            | 1,034                       | 1,428                   |
|                                     | 1902    | 3                    | 171,561       | 155,248               | 133,121      | 22,127             |                             | 16,313                  |
| Tennessee <sup>2</sup> .....        | 1907    | 3                    | 700,100       | 700,100               | 534,804      | 146,798            | 18,498                      |                         |
| Texas <sup>2</sup> .....            | 1907    | 4                    | 484,860       | 484,128               | 391,070      | 93,058             |                             | 732                     |
| Virginia.....                       | 1907    | 10                   | 1,444,593     | 1,434,429             | 1,122,482    | 172,207            | 139,740                     | 10,164                  |
|                                     | 1902    | 7                    | 359,158       | 355,600               | 327,200      | 28,400             |                             | 3,558                   |
| Washington.....                     | 1907    | 6                    | 1,295,428     | 1,135,051             | 898,397      | 221,085            | 15,569                      | 160,377                 |
|                                     | 1902    | 4                    | 618,385       | 562,332               | 483,902      | 76,635             | 1,795                       | 56,053                  |
| West Virginia.....                  | 1907    | 7                    | 326,752       | 323,434               | 282,923      | 9,102              | 31,400                      | 3,318                   |
|                                     | 1902    | 3                    | 105,102       | 105,102               | 103,434      | 1,668              |                             |                         |
| Wisconsin.....                      | 1907    | 7                    | 1,024,621     | 962,315               | 766,039      | 194,135            | 2,141                       | 62,306                  |
|                                     | 1902    | 9                    | 689,572       | 662,983               | 585,817      | 77,166             |                             | 26,589                  |
| All other states <sup>4</sup> ..... | 1907    | 16                   | 2,684,017     | 2,657,695             | 1,993,306    | 448,121            | 216,268                     | 26,322                  |
|                                     | 1902    | 25                   | 1,237,935     | 1,221,740             | 1,030,906    | 186,084            | 4,750                       | 16,195                  |

<sup>1</sup> Two companies in one of the outlying districts (Porto Rico) reported light plants, which have been excluded from this table.<sup>2</sup> Included in "All other states" in 1902.<sup>3</sup> No report for 1902.<sup>4</sup> Includes states having less than 3 companies, in order that the operations of individual companies may not be disclosed. These companies are distributed as follows: In 1907—California, 1; Colorado, 2; Connecticut, 1; Kentucky, 2; Louisiana, 2; Maryland, 1; Massachusetts, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Mexico, 1; Utah, 1; in 1902—Arkansas, 2; California, 2; Colorado, 2; Connecticut, 2; Delaware, 1; Indiana, 2; Kansas, 1; Kentucky, 2; Louisiana, 1; Maryland, 1; Minnesota, 1; Montana, 1; Nebraska, 1; New Hampshire, 1; New Jersey, 2; Oregon, 1; Tennessee, 2.

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## APPENDICES

APPENDIX A.—SCHEDULE

APPENDIX B.—INSTRUCTIONS TO SPECIAL AGENTS





# APPENDIX A.

## SCHEDULE.

Name of company or plant.....  
 Location of plant: {State..... County.....  
 {City or town..... Street and No.....  
 General Office (give state, city, street, and number).....

WASHINGTON, D. C., December 31, 1907.

The act of Congress of June 7, 1906, directs the Director of the Census to take a census of electric light and power stations every five years, and this schedule has been formulated for that purpose.

The information returned on this schedule should cover the business year of the company most nearly conforming to the year ending December 31, 1907. All questions that require a fixed time, such as cash on hand, number of lamps, etc., should be of the date of the last day of the year covered by the report.

The answers to inquiries in regard to financial matters will be held absolutely confidential; the separate reports will be combined so as to show totals for all companies in the different states. No publication will be made in the census reports disclosing the operations of individual companies. The information will be used only for the statistical purposes for which it is given.

The canvass is to be made under the supervision of Mr. W. M. Stuart, Chief Statistician for Manufactures.

S. N. D. NORTH,  
 Director of the Census.

Extract from act of Congress, March 3, 1899:

Section 22. \* \* \* "And every president, treasurer, secretary, director, agent, or other officer of every corporation, and every establishment of productive industry, whether conducted as a corporate body, limited liability company, or by private individuals, from which answers to any of the schedules, inquiries, or statistical interrogatories provided for by this act are herein required, who shall, if thereto requested by the Director, supervisor, enumerator, or special agent, willfully neglect or refuse to give true and complete answers to any inquiries authorized by this act, or shall willfully give false information, shall be guilty of a misdemeanor, and upon conviction thereof shall be fined not exceeding ten thousand dollars, to which may be added imprisonment for a period not exceeding one year."

### CERTIFICATE.

This is to certify that the information contained in this schedule is complete and correct to the best of my knowledge and belief, and it covers the period from ....., 190 , to ....., 190 .

(Signature and official designation of the person furnishing the information.)

(Signature of special agent.)

(Address of person furnishing the information.)

1. Character of ownership: State the form of ownership as it existed on the last day of the year covered by the report, whether individual, firm or partnership, incorporated company, municipal, or other form.....
2. If a consolidated company, give names and location of constituent companies included in this report, or write same on last page.....
3. If a reorganized company, give name of original company.....
4. If a subsidiary or leased company, give name and address of operating company or lessee.....
5. If the corporation or firm is engaged in any business or industry other than that of central-station work for electric light and power, state the character of such business or industry, and whether conducted in the same or separate plants..

6. Number of lamps: Account for all lamps wired for service on last day of year covered by report, irrespective of ownership. If actual number is not known give careful estimate.

| Class.                                                          | Type of lamp. | Public. (Number.) | Commercial or other private. (Number.) | Total. (Number.) |
|-----------------------------------------------------------------|---------------|-------------------|----------------------------------------|------------------|
| Arc lamps:                                                      |               |                   |                                        |                  |
| Direct current.....                                             | Open.....     |                   |                                        |                  |
|                                                                 | Inclosed..... |                   |                                        |                  |
| Alternating current.....                                        | Open.....     |                   |                                        |                  |
|                                                                 | Inclosed..... |                   |                                        |                  |
| Total.....                                                      | Open.....     |                   |                                        |                  |
|                                                                 | Inclosed..... |                   |                                        |                  |
| Incandescent lamps:                                             |               |                   |                                        |                  |
| Sixteen candlepower.....                                        |               |                   |                                        |                  |
| Thirty-two candlepower.....                                     |               |                   |                                        |                  |
| All other.....                                                  |               |                   |                                        |                  |
| Total.....                                                      |               |                   |                                        |                  |
| Other varieties (Nernst, vacuum, vapor, etc. [state kind])..... |               |                   |                                        |                  |

Lamps used by company to light its own properties, and not reported above: (For municipal plants include only lamps in power houses.)

|                                   |  |
|-----------------------------------|--|
| Arc.....                          |  |
| Incandescent.....                 |  |
| Other varieties (state kind)..... |  |

| 7. Miscellaneous statistics.                                                                                                                                    | Number. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Stationary motors served (do not include small fan motors).....                                                                                                 |         |
| Total capacity in horsepower.....                                                                                                                               |         |
| Give estimate of number of small fan motors served.....                                                                                                         |         |
| Railway motor cars served.....                                                                                                                                  |         |
| Meters on consumption circuits (include all kinds, mechanical, chemical, etc.).....                                                                             |         |
| Transformers in circuits for customers.....                                                                                                                     |         |
| Total capacity in kilowatts.....                                                                                                                                |         |
| Total number of customers furnished electric current.....                                                                                                       |         |
| Number of customers furnished electric current for heating or cooking apparatus.....                                                                            |         |
| Miles of street occupied by underground conduits for mains and feeders <sup>1</sup> .....                                                                       |         |
| (If underground conduits are rented from a municipality or commercial company, give particulars of agreement and annual rental paid, on last page of schedule.) |         |

## 8. Power-plant equipment.

| Generating power plant.           | 500 H. P. or under. | Over 500 H. P. and under 1,000 H. P. | 1,000 H. P. and under 2,000 H. P. | 2,000 H. P. and under 5,000 H. P. | 5,000 H. P. and over. |
|-----------------------------------|---------------------|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------|
| Steam engines, number.....        |                     |                                      |                                   |                                   |                       |
| Total capacity in horsepower..... |                     |                                      |                                   |                                   |                       |
| Steam turbines, number.....       |                     |                                      |                                   |                                   |                       |
| Total capacity in horsepower..... |                     |                                      |                                   |                                   |                       |
| Gas engines, number.....          |                     |                                      |                                   |                                   |                       |
| Total capacity in horsepower..... |                     |                                      |                                   |                                   |                       |
| Water wheels, number.....         |                     |                                      |                                   |                                   |                       |
| Total capacity in horsepower..... |                     |                                      |                                   |                                   |                       |

Auxiliary engines for use within plant as accessories, etc.:

Number....., total capacity in horsepower.....

<sup>1</sup> Length to be stated in miles and decimals of a mile carried to two places.

9. Electrical generators: The kilowatt capacity, voltage, and amperage reported should represent a single machine. If more than one machine of the same class, give separate information for each.

|                                                 | Number. | Total capacity in kilowatts of each machine. | Indicated voltage of each machine. | Indicated amperage of each machine. |
|-------------------------------------------------|---------|----------------------------------------------|------------------------------------|-------------------------------------|
| Dynamos:                                        |         |                                              |                                    |                                     |
| Direct-current, constant-voltage.....           |         |                                              |                                    |                                     |
| Direct-current, constant-amperage.....          |         |                                              |                                    |                                     |
| Alternating and polyphase current.....          |         |                                              |                                    |                                     |
| Boosters.....                                   |         |                                              |                                    |                                     |
| Rotaries.....                                   |         |                                              |                                    |                                     |
| Storage-battery cells in main power plants..... |         |                                              |                                    |                                     |
| Miscellaneous apparatus (state kind).....       |         |                                              |                                    |                                     |

10. Output of station: The output should be calculated from the voltage and amperage of the generators, or obtained from the actual watt or kilowatt readings of dynamo meters.

Kilowatt hours, average per day.....

Kilowatt hours, total for year.....

State the number of hours of operation, per day, if day circuits are not operated.....

11. Substation equipment: The kilowatt capacity, voltage, and amperage reported should represent a single machine. If more than one machine of the same class, give separate information for each.

| Class.                                    | Number. | Total capacity in kilowatts of each machine. | Indicated voltage of each machine. | Indicated amperage of each machine. |
|-------------------------------------------|---------|----------------------------------------------|------------------------------------|-------------------------------------|
| Storage battery, cells.....               |         |                                              |                                    |                                     |
| Transformers.....                         |         |                                              |                                    |                                     |
| Rotary converters.....                    |         |                                              |                                    |                                     |
| Miscellaneous apparatus (state kind)..... |         |                                              |                                    |                                     |

12. Cost of plant: The answer must show the total cost of land—buildings—machinery, tools, and implements within stations and shops—overhead and underground electric-service construction—lamps, motors, meters, and transformers wired for use—supplies of every description on hand not enumerated elsewhere. If land was donated, so state and give estimated value at time of donation, but *do not* include the amount in the total. For municipal plants include the preliminary cost of experts' reports, engineering plans, holding special elections, etc.

Cost during the year..... \$.....

Cost to date..... \$.....

Is value of franchise included? (Answer Yes or No).....

13. Supplies and materials used during the year for ordinary repairs and replacements: This inquiry is not intended to cover mercantile transactions, but if the company incidentally sells electric supplies and fixtures to its customers the quantity and cost of such supplies disposed of during the year should be included. If the company pays freight on any of the supplies and materials used, and the amount is not included in their cost, report the amount of this freight under "Amount of freight, if any, paid on the above." (Do not include expenditures for additions or extensions.)

| Kind.                                                                                       | Number. | Cost.   |
|---------------------------------------------------------------------------------------------|---------|---------|
| Supplies:                                                                                   |         |         |
| Meters.....                                                                                 |         | \$..... |
| Motors.....                                                                                 |         |         |
| Transformers.....                                                                           |         |         |
| Incandescent lamps.....                                                                     |         |         |
| Nernst lamps, vacuum and vapor lamps, etc.....                                              |         |         |
| Incandescent and other lamp fittings, sockets, etc. (Do not include arc-lamp supplies)..... |         |         |
| Carbons, globes, hoods, and other supplies for arc lamps, including arc-lamp repairs.....   |         |         |
| Poles or other supports.....                                                                |         |         |
| Wire and cable.....                                                                         |         |         |
| Fuel:                                                                                       |         |         |
| Coal.....                                                                                   |         |         |
| All other fuel (state kind).....                                                            |         |         |
| Electric current purchased for distribution <sup>1</sup> .....                              |         |         |
| Power purchased (state kind).....                                                           |         |         |
| Rent of water privileges for water wheels or turbines.....                                  |         |         |
| All other supplies and materials, including water for boilers, mill supplies, etc.....      |         |         |
| Total cost.....                                                                             |         | \$..... |
| Amount of freight, if any, paid on the above (not included in the "Cost").....              |         | \$..... |

<sup>1</sup> Give name and address of company from whom purchased.

| 14. Miscellaneous expenses.                                                                                                                                                                                                                              | Amount. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Rent of stations, and line-wire supports, conduits, or underground privileges.....                                                                                                                                                                       | \$..... |
| Rent of offices.....                                                                                                                                                                                                                                     |         |
| Taxes (state kind).....                                                                                                                                                                                                                                  |         |
| Injuries and damages.....                                                                                                                                                                                                                                |         |
| Insurance.....                                                                                                                                                                                                                                           |         |
| Ordinary repairs of buildings, machinery, etc. (Do not include amounts reported in Inquiry 13, "Supplies and materials").....                                                                                                                            |         |
| Amount paid for interest, advertising, office supplies, law expenses, telegraph and telephone service, and all other expense incident to operation and maintenance not elsewhere reported. (Do not include interest on bonds or dividends on stock)..... |         |
| Total.....                                                                                                                                                                                                                                               | \$..... |

15. Employees, salaries, and wages: The average number employed during the year is the number that would be required, at continuous employment, for the twelve months. If any of the persons enumerated were employed only a portion of the time, give only the wages paid in connection with the electric service. Account for all regular officers and employees whether engaged on maintenance, canvassing, collecting, operation, or otherwise. (Do not include employees engaged exclusively on additions or extensions.)

|                                                                                                                 | Average number employed during the year. | Total amount paid in salaries and wages during the year. |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------|
| <b>Salaried employees:</b>                                                                                      |                                          |                                                          |
| Salaried officers of corporation.....                                                                           |                                          | \$.....                                                  |
| Other officers (general managers, superintendents, electricians, and experts).....                              |                                          |                                                          |
| Clerks and bookkeepers.....                                                                                     |                                          |                                                          |
| Total.....                                                                                                      |                                          | \$.....                                                  |
| <b>Wage-earners (do not include salaried employees reported above):</b>                                         |                                          |                                                          |
| Foremen.....                                                                                                    |                                          |                                                          |
| Inspectors.....                                                                                                 |                                          |                                                          |
| Engineers.....                                                                                                  |                                          |                                                          |
| All other employees (including firemen, dynamo and switchboard men, linemen, mechanics, and lamp trimmers)..... |                                          |                                                          |
| Total.....                                                                                                      |                                          | \$.....                                                  |

16. Income: Give the total amount of income for the year as indicated by the books of the company. If accounts do not show the income from each class of service enumerated, give a carefully estimated segregation.

Commercial companies should include not only income from current actually sold, but also the estimated value of current supplied municipality or other government free of charge, the estimate to be based on the prevailing commercial rates. (Estimated value of current consumed by lamps and motors on the company's own properties should not be included.)

Municipal plants must include in answer to the inquiry the estimated value of current consumed in public buildings and in lighting streets, parks, etc., the estimate to be based on the prevailing commercial rates. (Estimated value of current consumed by lamps and motors in municipal-power houses should not be included.)

| Source.                                                                       | Amount. |
|-------------------------------------------------------------------------------|---------|
| <b>Lighting:</b>                                                              |         |
| Commercial or other private—                                                  |         |
| Arc lamps.....                                                                | \$..... |
| Incandescent lamps.....                                                       |         |
| Other lamps.....                                                              |         |
| Public, furnished municipality or other government for buildings and streets— |         |
| Arc lamps.....                                                                |         |
| Incandescent lamps.....                                                       |         |
| Other lamps.....                                                              |         |

| Source.                                                         | Amount. |
|-----------------------------------------------------------------|---------|
| Motor service, stationary (not including small fan motors)..... |         |
| Electric-railway service.....                                   |         |
| Sale of current to other electric companies.....                |         |
| Electric heating, cooking, welding, etc.....                    |         |
| Charging automobiles.....                                       |         |
| All other electric service (specify items).....                 |         |
| Gross income from sale of supplies and fixtures.....            |         |
| Income from all other sources (specify items).....              |         |
| Total.....                                                      | \$..... |

If a commercial company, give amount of estimated income for free service, which is included above..... \$.....

If a municipal plant, give amount of estimated income represented by current consumed in public buildings and in lighting streets, parks, etc., which is included above..... \$.....

17. Capital stock, bonds, dividends, and interest: If the company operates a gas or water plant or other industry in connection with the electric light and power plant, and it is impossible to segregate the capitalization, report the entire capital and give an estimate of the proportion chargeable to the electric light and power plant department.

|                                              | Number of shares or bonds. | Total par value. | Dividends declared and interest paid or due for the year. |             |
|----------------------------------------------|----------------------------|------------------|-----------------------------------------------------------|-------------|
|                                              |                            |                  | Rate.                                                     | Amount.     |
| <b>Authorized capitalization by charter:</b> |                            |                  |                                                           |             |
| Common stock.....                            |                            | \$.....          | x x x x                                                   | x x x x x x |
| Preferred stock.....                         |                            |                  | x x x x                                                   | x x x x x x |
| Bonds.....                                   |                            |                  | x x x x                                                   | x x x x x x |
| <b>Capital stock and bonds outstanding:</b>  |                            |                  |                                                           |             |
| Common stock.....                            |                            |                  |                                                           | \$.....     |
| Preferred stock.....                         |                            |                  |                                                           |             |
| Bonds.....                                   |                            |                  |                                                           |             |

Estimated proportion of above outstanding capitalization chargeable to the electric light and power plant department.....

18. Poles purchased during 1907.

| Length, feet.                 | Cedar.  |                                             | Chestnut. |                                             | Juniper. |                                             | Other species. (Specify.) |                                             |
|-------------------------------|---------|---------------------------------------------|-----------|---------------------------------------------|----------|---------------------------------------------|---------------------------|---------------------------------------------|
|                               | Number. | Average cost per pole at point of purchase. | Number.   | Average cost per pole at point of purchase. | Number.  | Average cost per pole at point of purchase. | Number.                   | Average cost per pole at point of purchase. |
| Under 20.....                 |         |                                             |           |                                             |          |                                             |                           |                                             |
| 20 and over but under 25..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 25 and over but under 30..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 30 and over but under 35..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 35 and over but under 40..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 40 and over but under 45..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 45 and over but under 50..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 50 and over but under 55..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 55 and over but under 60..... |         |                                             |           |                                             |          |                                             |                           |                                             |
| 60 and over.....              |         |                                             |           |                                             |          |                                             |                           |                                             |

How many treated poles were purchased during 1907?.....

What preservative was used?.....

How many poles were treated during 1907?.....

What preservative was used?.....



## APPENDIX B.

### INSTRUCTIONS TO SPECIAL AGENTS.

*Period covered.*—The act of Congress, approved June 7, 1906, provides that every five years this office shall collect statistics relating to electric light and power stations. The census of this industry will relate to the year ending December 31, 1907, and all plants that were in existence during any portion of the year must be reported.

*Special agents, daily reports, and correspondence.*—The canvass will be made by the regular employees of the Census Office working under the supervision of the chief statistician for manufactures. The employees detailed for field work must make daily reports on Form 8-185b for every day on which they are actually employed. The daily reports, together with all schedules taken daily, must be forwarded by registered mail at the close of each day, in the return penalty envelope addressed to the Director of the Census. *The office number and the running number of the report should be placed on the daily report for all schedules sent in.* Inquiries concerning schedules or further instructions must be made by letter and not on the daily reports. Each inquiry or requisition should be made in a separate letter. Employees must give sufficient notice of the date they will complete the district to which they are assigned, so that, if necessary, they may be assigned to other territory without loss of time.

In all correspondence, make reference to office letters by date, and to schedules and memoranda containing criticism, by referring to the office number on the list and the full name and address of the company in question.

*Day's work.*—The relative efficiency of each employee engaged in field work will be determined by the number and completeness of the reports secured. Each daily report must account for the work of the day. Schedules *must not* be retained for a number of days and daily reports made out so as to show a fair average for each day.

*Districts and lists.*—The entire country has been divided into districts and one or more special agents will be assigned to each district. The agents will be held accountable for a thorough canvass of their respective districts. To assist in locating the plants to be enumerated, each agent will be furnished with a list giving the names, locations, and addresses of all electric properties covered by the census in the territory assigned him. These lists are based on information obtained from directories, postmasters, and other sources. *The agents must not accept them as complete, but must be constantly on the alert to discover other plants or systems, especially municipal electric fire-alarm and police-patrol systems in towns of less than 2,500 inhabitants.*

The different cities must be visited in the order named on the list, unless the agent finds that railroad connections and local conditions make a change advisable. In such cases the character and necessity for the change must be given on the agent's daily report.

An agent should not return to a city already canvassed to secure information for a report returned to him for correction unless especially advised to do so. It is believed that the agent will be able in most cases to supply the information from his knowledge of the conditions. If he can not do so, he should return the schedule to the office with such explanation for his error or neglect as he may be able to make. To obviate the necessity of returning schedules for additional information, the agent must be careful to secure *complete* reports for all plants before leaving a city.

*Reports secured by mail.*—Schedules were mailed to all companies, and if a *complete* report has been thus secured, the name on the agent's list will be marked "schedule received." If the mail report is unsatisfactory, the name will be stamped "incomplete schedule received," and the original schedule furnished the agent to complete. These schedules must be completed or corrected, signed, and returned by the agent. If it is found advisable to prepare a new report in place of the original, such report must be marked "corrected report" on the title page. Otherwise the agent will still be charged with the original schedule. If the agent has not been advised that the office is in receipt of the report, he must secure the same, although the company may claim that the schedule has been furnished.

*Proposed plants.*—Some of the names on the list are for plants or systems that were contemplated or projected, or supposed to be under construction, but not necessarily building or in operation; when possible, such plants have been designated as "proposed," or as "under construction." These plants should not be visited when it requires a special trip unless the agent can obtain information that they were actually in operation. If for other purposes the agent visits a place where such a plant or system is supposed to be located, he must account for the name on his daily report and give information which will enable the office to dispose of the name on the office list.

*Idle plants.*—The instructions in the preceding paragraph in regard to "proposed" plants are applicable also to idle plants. While the census is to cover all plants that were in existence during 1907, the agent should not make a special trip to secure the report of a plant that was not in operation during any part of the year.

*New plants.*—If a report is secured for a listed company under a name other than that given on the agent's list, a memorandum must be made on the schedule giving the name of the company as it appears on the list. If this is not done, the name will remain on the list as charged to the agent. If schedules are secured for plants not on the list, the words "not on list" must be written in the upper left-hand corner of the title page.

*Central offices.*—A large number of properties are controlled from offices located elsewhere than at the plants. When known, central offices of this character are indicated on the lists with the names of the plants for which reports will be prepared at the central office. Agents canvassing the districts in which central offices are located must in every instance secure reports from these offices before canvassing the other plants. A large number of controlling companies have advised the office that reports for certain properties will be prepared at their office. The names of these controlled companies will appear on the agent's list without a number, but with a notation "see central office," or "report will be secured at ———." Agents must not secure reports for these controlled companies unless especially directed to do so. If in the city, the agent should call at such plants and explain that a census of electrical industries is being taken; also that it is understood the report is being prepared at the central office of the company. He should also leave blank schedules, explaining the requirements of the census, so that the local officials will know just what information is required if the central office requests them to furnish data for the reports.

If a plant is owned by a company whose business office is in

another locality outside the territory assigned the agent and a portion of the information must be obtained from such office, the agent should complete the schedule so far as possible from the data obtainable at the plant and forward it to the Census Office with a full statement of the facts, giving also the names and addresses of the persons from whom further information can be obtained. The agent must, however, exhaust every reasonable means to complete the report before sending it in to the Census Office.

*Annual reports.*—In all cases where an annual report of the company is printed, a copy of the latest report should be secured and forwarded with the schedule. Copies should also be returned of the latest report of the directors or officers of the company, or other printed matter that would add to the information contained in the schedule.

*The schedule.*—An exact answer to each question enumerated in the several inquiries is what is required, and is what should be given if it can be secured with a reasonable amount of labor. It is anticipated, however, that in a number of cases the accounts are not kept under just such a series of items as is enumerated in the schedule. If the accounts cover two or more of the items enumerated for any of the inquiries, the total should be equitably apportioned for the reply to each subinquiry. In all cases where the answers are estimated the amounts must be preceded by the word "estimate."

All answers must be made clearly and neatly in ink. Amounts and values must be obtained from book accounts, if such accounts are available. Each question is to be answered. If any question is found not applicable and no amounts are reported, write the word "none."

The following instructions, in addition to those on the schedule, should be followed by the agents in preparing all reports:

*The title-page.*—Page 1 must contain the name and location of the company, the address of the general office, and the signature, address, and official designation of the person furnishing the information. *Place the office number and the running number of the report in the upper right-hand corner.* If the address of the general or business office is at a different place from that of the plant, care must be taken to give both.

The reports for plants that were in operation only a portion of the census year will be tabulated separately; therefore it is essential to give on the title-page the exact period covered by each report.

Reports must be secured for all electric plants doing a public-service business; that is, for all plants, whether owned or operated by individuals, companies, corporations, or municipalities, established for the purpose of generating electric current for sale, that were in existence during any portion of the year ending December 31, 1907.

No report is required for isolated electric light or power plants operated primarily for the benefit of the owner in lighting and furnishing power for his factory, hotel, or other enterprise, even though some current may be sold. The instructions on the title-page of the schedule provide that "isolated plants which incidentally sell current must be reported." This was intended for the guidance of persons who would receive the blank schedule through the mail, and to avoid the possibility of omitting any central stations. Such plants can not be considered as central stations, and agents must not secure reports for them.

Electric plants owned by the United States Government and operated primarily for supplying light or power to public buildings, military posts, naval stations, Indian reservations, etc., should be considered isolated plants and no report secured; also electric plants owned by and operated primarily for the benefit of state institutions.

*Combined reports.*—If the electric plant is operated in connection with an electric railway, separate reports should, if possible, be prepared. If this can not be done, a combined report should be prepared on the railway schedule.

If the electric plant is operated in connection with any business other than a street railway and the system of accounts will not permit of the preparation of a separate return, careful estimates

must be prepared for answer to all the questions contained in the schedule; these estimates must be prepared by, or submitted to and approved by, the person furnishing the information. The items of cost of plant; supplies and materials; miscellaneous expenses; employees, salaries, and wages, and income, must pertain only to the electric light or power station.

Where two or more plants are owned by one individual, company, or corporation, and located in the same city or town, one combined report may be secured. In such cases the number of separate plants included in the report should be stated in answer to inquiry 2. Light and power plants operated by the same corporation, firm, or individual, and located in different states, counties, cities, or towns should be reported separately.

#### INQUIRIES 1 TO 5, INCLUSIVE.

These are intended to obtain information concerning the character of the organization under which the company is operated, the character of the changes in such organization, and whether or not conducted in connection with some other industry. The answers given to each of these questions must be consistent.

#### INQUIRY 6.—NUMBER OF LAMPS.

The answers to this inquiry must show the total number of the different varieties of lamps connected or wired ready to render service, and not the number actually performing service at any one time. The total must include all lamps in position to earn an income, irrespective of their ownership. Therefore it may include many lamps that are *not owned* by the company. If there is no record of the actual number of lamps, secure a careful estimate. The distinction between "public" and "commercial or private" lighting must be carefully preserved. This public service is the lighting of streets, parks, public buildings, and all other public places for the illumination of which the municipality or other form of government is responsible.

Open arc electric lamps are usually employed in street lighting, and are those having either one or two pairs of carbons inclosed in a single large globe. They are designed to burn a small number of hours (ten to fifteen) before having the carbon renewed. An inclosed arc lamp has two globes, a large or outer one inclosing a small one in which a single pair of carbons is incased, and is designed to burn a large number of hours (one hundred to one hundred and fifty) before having the carbons renewed. Both kinds may be either of the direct-current or of the alternating-current type.

#### INQUIRY 7.—MISCELLANEOUS STATISTICS.

*Stationary motors.*—This term is applied by central station men to electric motors that are permanently located in one place, as distinguished from electric railway motors on cars. Such stationary motors will cover an infinite variety of work, and in many cases the companies will have difficulty in reporting the number of motors on their circuits, or in giving the separate income from motors (inquiry 16), especially where current is furnished through meters. But the inquiry must be pushed, and where exact figures can not be given from records it is desirable that a close estimate be secured. The field covered by these stationary motors will include every class of industrial work and many other methods of application, such as in running large ventilating fans, elevators, etc. It is a custom of many companies to make special rates for what they call "power" business, as distinct from that done in supplying current for lamps; and where this is the case, their records should show the data as to motor service and income.

The actual or the estimated number of small fan motors and railway motor cars served with current should be reported for every plant.

*Meters on consumption circuits.*—This inquiry applies solely to meters installed on the consumers' premises, just as gas meters are, and does not relate to meters installed at the central station.

*Transformers in circuits for customers.*—The number and total capacity in kilowatts of all transformers in circuits for customers should be reported here.

A great deal of electrical work in scattered communities is done with the aid of transformers, which are also to be found in some of the larger cities at the customers' end of the line, although as a general thing in large city plants it is the practice to furnish direct current to the consumer, in which case transformers are not needed outside the station or substation. Where the lamps in a customer's house or store are fed with alternating current, the transformers are placed on an adjacent pole or in a cellar or other room where they are not generally accessible, as the primary voltage is dangerous to life. The current is sent out at a high pressure from the central station and is received by the primary coil in the transformer at perhaps 1,000 to 2,000 volts. The secondary coil takes the small-quantity high-pressure current from the primary coil and transforms it into large-quantity low-pressure current for use in the lamps, motors, etc. The coils and the iron core they surround are inclosed in water-tight metal boxes, which present a rough resemblance to mail boxes and fire-alarm boxes.

#### INQUIRIES 8 AND 9.—POWER-PLANT EQUIPMENT AND ELECTRICAL GENERATORS.

The capacity of the engines and water wheels and of the dynamos is closely related. The engines and water wheels, as a rule, have an excess capacity over that of the dynamos. "Auxiliary engines" will sometimes be found in small stations, but in the larger plants electric motors are in common use to drive pumps, etc., and the superintendent or manager can readily enumerate them.

There will be no difficulty in ascertaining the facts as to the different classes of dynamos. The voltage of machines for lighting purposes varies greatly. In all cases the kilowatt capacity, voltage, and amperage reported must represent a single machine. If there is more than one machine of the same class, give separate information for each.

Storage batteries are used, either in the main power plants or in the substations, to help maintain a steady supply of current at the right pressure, and "boosters" are dynamos assisting to the same end. The substation is particularly a feature of long-distance work, but competent engineers are generally to be found who can give the substation equipment should it not be in possession of the management.

#### INQUIRY 10.—OUTPUT OF STATION.

The kilowatt hours may be tested by the earnings. The average earnings per kilowatt hour for all plants at the census of 1902 was about  $3\frac{1}{4}$  cents. The average varies considerably for individual plants, but if the average is less than 1 cent or more than 15 cents per kilowatt hour, the figures should be questioned and if found correct, explanation made.

A standard arc lamp consumes from 450 to 550 watts per hour; ordinary standard incandescent lamps of 16 candlepower have an average consumption per hour of about 3.1 watts per candlepower. Many incandescent lamps now in use, like the tantalum, take less.

In all calculations of average earnings per kilowatt hour and consumption of current per lamp, etc., the loss of current in transmission must be considered.

#### INQUIRY 11.—SUBSTATION EQUIPMENT.

The feature of substation equipment is that it does not generate current, but receives it, manipulates it, stores it, and lowers the pressure or changes the form for local consumption. All the generating plants will usually be found in the generating stations, but sometimes substation apparatus will be found under the same roof as the main generating plant apparatus.

#### INQUIRY 12.—COST OF PLANT.

The answer to this inquiry must show the total cost of the plant and equipment up to the end of the year for which the report is made, with a separate statement of the cost of additions and extensions during the year. The cost of plant must include all ex-

penses incident to the organization of the company and the establishment of the plant. If the land was donated, that fact should be stated and the estimated value at the time of the donation given separately, but not included in the total.

#### INQUIRY 13.—SUPPLIES AND MATERIALS USED DURING THE YEAR FOR ORDINARY REPAIRS AND REPLACEMENTS.

The actual cost of all materials and supplies used during the year must be reported. In answering this inquiry report only the materials and supplies that were used for ordinary repairs or replacement during the year reported. Expenditures for additions to the plant, such as new machinery, or additional lines on which new meters, motors or transformers, or lamps are installed, should be included in answer to inquiry 12, cost of plant.

As a rule all equipment that adds to the capacity of the plant should be regarded as "extension" and whatever merely sustains existing efficiency as "repairs." Incandescent lamps are often paid for by the central-station customers. If this is the case, only those used in renewing street lamps or such others as the company is responsible for should be reported. The quantity (number) and cost should be given for the first five articles listed under supplies. If large quantities of supplies or fuel were purchased with a view of taking advantage of low prices, that fact must be stated in a footnote, but in such cases the answer to the inquiry should show only the quantity and cost of such as were consumed during the year.

The cost of water hired or rented to run water wheels or turbines should be reported in answer to the question "rent of water privileges for water wheels or turbines." The amount paid annually for land used for obtaining a water supply should not be reported in answer to this question, but should be included under the first question of inquiry 14—miscellaneous expenses.

*Amount of freight, if any, paid on the above (not included in the "cost").*—If the company reporting pays freight on any of the supplies and materials used, and the amount is not included in their cost, the amount of the freight should be reported in answer to this question.

#### INQUIRY 14.—MISCELLANEOUS EXPENSES.

All items of expense incident to the business for the year and not included in answer to inquiries 13 and 15 must be reported here. Do not include any portion of the freight reported under inquiry 13 as paid on supplies and materials. Expenses incident to additions or extensions of the plant or line should not be included in answer to inquiries 13, 14, or 15. The cost of such additions must be reported as cost of plant—inquiry 12.

#### INQUIRY 15.—EMPLOYEES, SALARIES, AND WAGES.

Account for all regular employees of the company who were required to supervise and keep up the usual work of the plant. Do not include those employed exclusively on extension work. Give the number of officers who receive salaries (not the number of stockholders) and the gross amount of their salaries. Report separately the number and wages of foremen, inspectors, and engineers. In a few cases the company may rent houses to, or possibly board, its employees at a reduced rate; in such cases the salaries and wages reported should include the allowance for board or rent furnished as part compensation. The average number employed during the year is the number that would be required, at continuous employment, for the twelve months. There should be no difficulty in securing this information for the plant of ordinary size, but it may be that the large companies keep an itemized pay roll, the total only being carried forward each week or month. In such cases it will be necessary either to add the pay roll of each week or month, for each class of employees, or to compute the aggregate for each class, using a pay roll for a representative week or month as the base. Results obtained by the latter method will be accepted.

#### INQUIRY 16.—INCOME.

The total amount of income indicated by the books of the company for the entire year should be reported. Give separate amounts

for the different sources enumerated. Electric companies frequently furnish free service to the municipality in which they are located, such as the illumination of some or all of the public buildings, the supply of a certain number of lamps, or the granting of a special discount on the lamps used, or in other ways make a return for the ordinance or franchise by which the company was granted the use of the streets. The value of this free service must be estimated and included as indicated by the inquiry, and must also be stated separately in answer to the subquestion, "If a commercial company, give amount of estimated income for free service, which is included above."

It is essential to show separately the income from commercial or private service and public service. If incandescent and arc lamps are connected on the same meter, and it is found impossible to separate the income, the total income for both classes of service should be ascertained and a careful estimate made for the two classes. Public-lighting contracts are usually made for a term of years. The customary contract is based on what is known as a lighting schedule. Two principal schedules which show the extremes are, respectively, designated by business men as the "all-night-and-every-night schedule," estimated at 4,000 hours per year, and the "dark-of-moon, every-night, one-hour-after-sunset-until-12-o'clock-midnight schedule," estimated at 1,200 hours per year. Between these extremes are numberless variations. The income received from public service, therefore, can be very easily ascertained. If this income is not shown separately for arc lighting and incandescent lighting, the separation should be estimated in the same manner as above indicated for arc lighting and incandescent lighting in general.

Electrical signs have become quite an important feature of central station work. These signs are usually lighted by incandescent lamps, and the income from this service should be accounted for under the proper item of inquiry 16, and the number of lamps wired for service included under inquiry 6.

Under normal conditions the net income—i. e., the total income for the year as reported in inquiry 16, less the total expenses of operation and maintenance (the sum of the totals of inquiries 13, 14, and 15)—should be sufficient to pay the dividends on stock and the interest on bonds reported in inquiry 17. If the net income is not sufficient to pay the dividends and interest for the year, or if a net deficit is indicated for the year's operations, attention should be called to this fact, and if found correct, explanation made under "remarks."

#### **INQUIRY 17.—CAPITAL STOCK, BONDS, DIVIDENDS, AND INTEREST.**

Account for the entire amount of stock and bonds authorized by charter and the amount outstanding on the last day of the year covered by the report. Give full amount of dividends declared and interest paid or due for the year. The *rate* of interest should always be stated, even though no interest may have been paid or due for the year.

If some other industry is carried on in connection with and by the use of the same capitalization, the estimated proportion chargeable to the electric light and power plant department may be based upon the ratio between the income of the lighting plant and the total income from all departments represented by the entire capital liability.

#### **INQUIRY 18.—POLES PURCHASED DURING 1907.**

This inquiry is separate and distinct and bears no direct relation to the other inquiries of the schedule. The instructions on the schedule should be applied, and the questions answered for all companies or plants.

##### **MUNICIPAL PLANTS.**

Schedule B2-231 is prepared primarily for plants owned by individuals, companies, or corporations. In applying this schedule to plants owned and operated by municipalities certain changes will be necessary. These changes should be made by the agent, and additional information, when required, must be given under "remarks" on the last page of the schedule.

It will often occur that the administration of a municipal plant is assigned to a public officer or officers performing other duties, or that a part or all of the labor of collecting and accounting is done in the office of some other department—waterworks, for example. If, in these cases, a general account is kept for two or more departments, such as water, streets, etc., the expenses for the electric plant should be apportioned equitably. The following plan is suggested to aid in arriving at an equitable apportionment of the salaries, wages, miscellaneous expenses, etc.: For officers, clerks, and all employees, charge to each service the same proportion of the total amount paid in salaries or wages as the time devoted to that service constitutes of the whole time worked; for rent and all sundry office expenses, charge in proportion to the income of each service; for insurance, taxes, law expenses, interest, and all contingent expenses, in proportion to the amount of investment; for fuel, water, and all other power expenses, in proportion to the horsepower utilized by each service.

*Inquiry 12—Cost of plant.*—The installation of municipal plants is frequently attended by a preliminary cost for experts' reports, engineering plans, specifications, printing, advertising, holding a special election, traveling inspection by a special committee, etc., which would not, under ordinary circumstances, be included in the cost of the plant. Care must be taken in all cases of this character to include such expenses in answer to this inquiry.

*Inquiry 16—Income.*—As shown by the instructions on the schedule, the income for municipal plants must include not only the actual cash received for service to private interests, but also the value of the service to the city if paid for at prevailing commercial rates, because the industry must be charged with all expenditures incident to it for the year and therefore should be credited with an income for all service rendered and which was made possible by the expenditure. As called for by the last subquestion of the inquiry, an estimate of the income of the municipality's own free service is required separately.

*Inquiry 17—Capital stock, bonds, dividends, and interest.*—The portion of the inquiry relative to capital stock and dividends is not applicable to municipal plants. As a rule there is a special bond issue to cover the installation of the electric plant. The amount of such bonds authorized by the special act and the amount outstanding at the end of the year, together with the interest paid or due for the year, should be reported. If, however, there was no special issue of bonds, the cost of the electric plant being met by proceeds of a general bond issue or special tax fund, a full explanation of the arrangement and a description of the general bond issue or special tax should be given under "remarks."



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